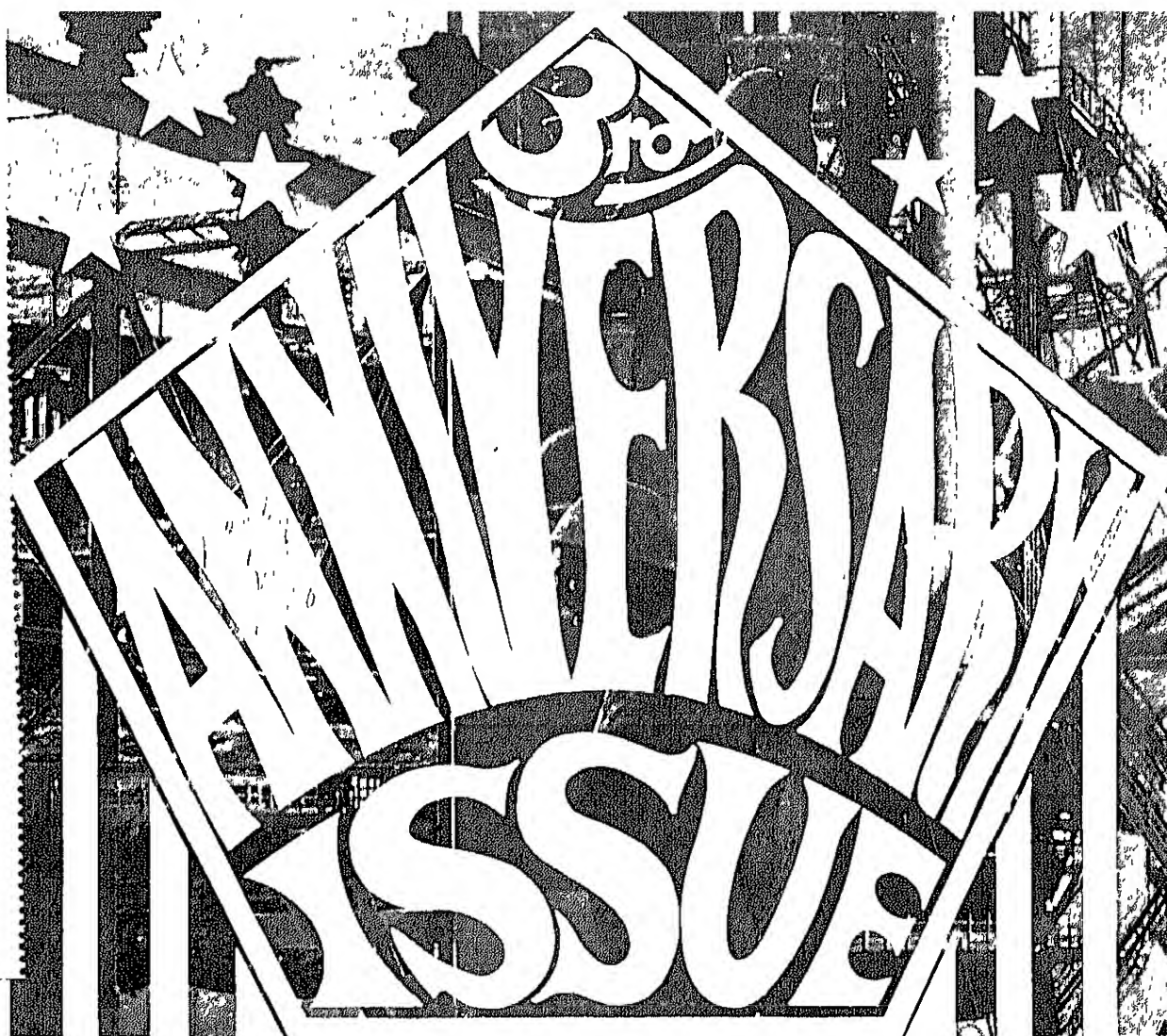




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Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

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Standardization

The Answer to the Fleet Spare Parts Dilemma

Captain Carl B. Ihli, USN

THE U.S. Navy is attempting to eliminate the influx of an unnecessary variety of individual items into its inventory with the application of a Component/Equipment Standardization Program, managed by the Office of the Director of Standardization and Configuration Management under the Deputy Chief of Naval Material (Logistics Support).

Under the program, the Navy emphasizes multi-year procurement of larger blocks of identical equipment, incentive clauses for using a larger number of standard components/equipments, and life cycle cost considerations in procuring hardware systems.

Effort is being made to re-use in new design those reliable in-service components already supported in the Military Supply System by a range of spare parts.

Although all the Naval Material Command's systems commands (Air, Electronics, Facilities Engineering, Ordnance, Ships and Supply) have been directed to pursue the program, deepest analysis to date has been in the area of ships parts (hull, mechanical and electrical).

This article will be devoted to hull, mechanical and electrical shipboard equipment and their repair parts, and they will be identified as:

"S" Cog—Under Naval Ship Engineering Center management control.

"H" Cog—Under Ship Parts Control Center management control.

By the Numbers

Unless the component/equipment spare part has a Federal Stock Number or manufacturer's identification, model, or part number, the logistics support comes to a halt until applicable numbers are determined in the

hull, mechanical and electrical master technical records (Figure 1). All Allowance Parts Lists (APLs), regardless of revisions, are retained for five years to ensure available data to verify contract range and depth of repair parts.

The Ship Parts Control Center, Mechanicsburg, Pa., as the inventory control point, manages currently a total of 291,000 items, of which 180,000 items are "H" Cog in support of hull, mechanical and electrical components/equipments. Since the establishment of the Defense Supply Agency (DSA), approximately 125,-

000 items have been transferred to DSA from the Ship Parts Control Center and more are due for transfer. Close liaison between the supply activities is required to meet the needs of the fleet. Migration to DSA continues for "H" Cog repair parts and, conversely, many "S" Cog components/equipments are being transferred from the Naval Ship Engineering Center to the Ship Parts Control Center. As the inventory control point repair parts supply management at the Ship Parts Control Center is reduced, the complete equipment supply responsibilities increase.

SPCC			MASTER TECHNICAL RECORDS	
1) TPCR	(TECHNICAL PARTS CHANGE RECORD)	7,500,000 CARDS		
2) DECK "A"	(ITEM RECORD CROSS OF PART NOS TO COMPONENT)*	3,280,300 CARDS FOR 1,723,240 RECORDS		
3) DD 146	(ITEM IDENTIFICATION CARDS)	1,059,000 CARDS		
4) DECK "D"	(COMPONENT CHARACTERISTICS)*	288,880 CARDS FOR 220,000 COMPONENTS		
5) DECK "E"	(SHIP APPLICATION OF COMPONENTS)*	690,000 CARDS FOR 220,000 COMPONENTS		
6) PRINTED APLs	(ALLOWANCE PARTS LIST)	201,100 COMPONENTS		
	* ON TAPE			

Figure 1.

Old Ships

Figure 2 shows the age of active fleet ships. By activation action from the Reserve Fleet over the past two years, the percentage of active ships, built in World War II, has increased from 54 percent to 59 percent of the total fleet population. The age of the ships has a major impact on the supply support problem.

Auxiliary and amphibious ships have proved problematical during their activation. Examples of problems encountered are:

- Manufacturer of the equipment is no longer in business, and the time element requires the repair parts to be manufactured by the shipyard.

- Component was not installed in any active fleet ships and there were no supply demands for equipment repair parts during the ship's inactive (reserve fleet) life. Accordingly, all parts had been disposed of in the past to reduce stock inventories at inventory control points.

The overall repair part problems of the World War II ships, as well as ships built after World War II, can best be stated in the following sequence showing corrective actions:

- Manufacturer is no longer in business. An attempt is made to obtain another source, by competitive bid, to manufacture the repair parts. Some success is achieved only if the fleet population indicates continuing need and warrants cost from the manufacturer's viewpoint.

- Manufacturer is in business but no longer manufactures the component or repair part. If sales were sufficient, the manufacturer would still be making the repair parts. This problem, prevalent in procuring low-population items for the Fleet, must be answered by finding another source to manufacture these repair parts or replacing the component. In many instances, operational requirements of the ship necessitate local shipyard manufacture of the part which consumes valuable time and is more expensive. "Borrowing" from sister ships in the Reserve Fleet has been of immediate help, but this is not a long-term answer.

- Manufacturer is in business, no longer manufacturing component, but will manufacture repair parts. Basically, because the buy is not a large-quantity buy, long lead time is involved. Industry readily recognizes an obligation to support its equipment in

the Fleet, but small-quantity buys of parts, that interrupt normal production, receive low priority. For example, one company, having many types of equipment installed in critical systems in the Fleet, now has only five percent of its business with the Navy, 30 percent export and 65 percent with commercial industry; only by quantity buys, that support a continuing production line for repair parts, can supply support be effective.

Another prime contributor to the repair part dilemma for old ships in the Fleet is the inherent meaning of the term "old." Some hull, mechanical and electrical equipment failures occur in basic parts that are not considered repair items. This type of "insurance" item is not normally carried in stock. A replacement buy is initiated and long lead time is invariably involved if the equipment is obsolete or obsolescent. A prime example is diesel engine blocks. Many manufacturers keep a limited spare part inventory, if any at all, on slow moving items, especially in states where inventory tax is imposed.

New Ships

A difficult problem in ship construction is created when provisioning is not invoked. MIL-P-15137C is the provisioning military specification and is not always invoked, both for government-furnished material and con-

tractor-furnished material. Provisioning is the initial step in ensuring that follow-on supply support action will be taken for the ship. As part of the provisioning action, Provisioning Technical Documentation is submitted to the Ship Parts Control Center for new components with recommendation as to range of repair parts to be carried as on-board repair parts. This action leads to an approved allowance of on-board repair parts in both range and depth. Action is then initiated to have Federal Stock Numbers assigned to new repair parts, and to advise all inventory control points of new supply stock requirements to ensure the availability of replenishment repair parts.

Unless a Federal Stock Number with applicable stock is established, requests from the Fleet for repair parts are needlessly complex causing extensive technical research, resulting in a single spot buy. This can only result in lost time for everyone. If the equipment selected is already in the Fleet, then the contractor need only certify identity to an existing Allowance Parts List and, since range and depth of on-board repair parts have already been established and stock is in the system for backup, no time is lost.

Shipbuilders need to pay more attention to provisioning, as will be discussed later in this article. This

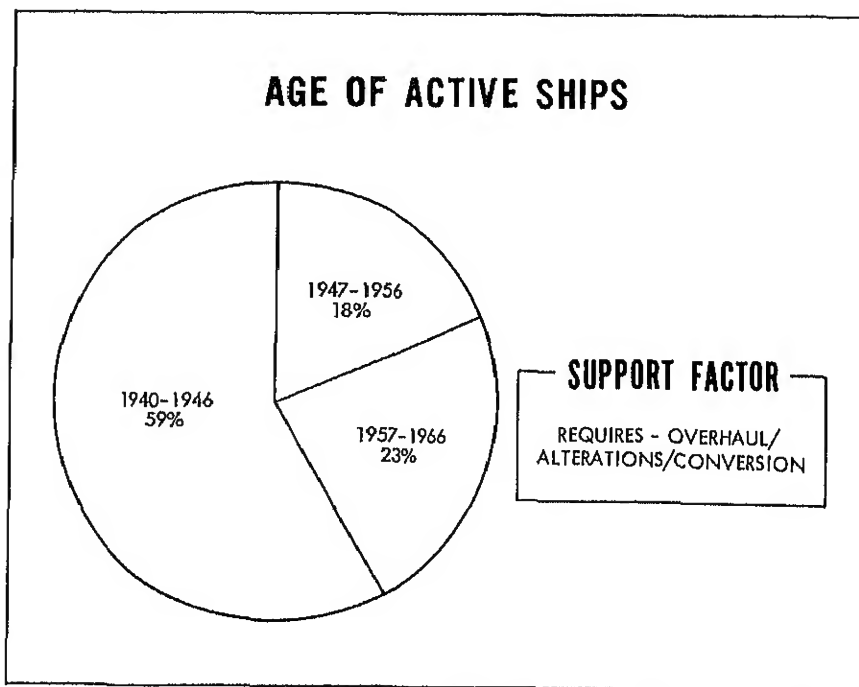


Figure 2.

Selected CIDs/APLs Population

CID No.	Item	1963	1964	1965	1966	1967	Percent Increase (1967/1963)
01	Pumps	5,076	6,609	7,217	7,777	7,889	55
06	Compressors	575	712	783	848	876	52
15	Controllers	11,728	14,558	15,964	17,368	17,846	52
16	Generators	840	1,111	1,177	1,216	1,234	47
17	Motors	11,715	14,619	15,916	16,910	17,425	52
33	Air Conditioning	65	78	128	167	198	200
45	Gages	931	1,262	1,705	1,951	2,114	160
48	Filters	1,216	1,699	1,949	2,145	2,273	87
78	Couplings	624	1,021	1,054	1,103	1,124	79
88	Valves	24,061	35,314	40,611	43,670	46,096	91
91	Laundry Equipment	453	559	593	638	697	54

Figure 3.

requirement is essential if the ship is to be supported during its operation by the supply system for repair parts.

Hardware is worthless if technical documentation does not adequately cover the component/equipment.

As much as 20 percent of the component/equipment is not received until the final months of the construction period, which does not provide sufficient time to accomplish all the actions that will provide repair parts from the supply system on commissioning. Approximately 70 to 75 percent of hull, mechanical and electrical equipment in newly constructed ships is covered by existing Allowance Parts Lists.

New Designs

The influx of new equipment in the hull, mechanical and electrical component/equipment has created problems in repair part support where:

- The "new car" approach is taken by some designers. By this approach designers change a few dimensions of parts that do not increase production costs but result in new repair parts, new Federal Stock Numbers for the same basic equipment. Sometimes this is profitable for the manufacturer and costly for the shipbuilder when new Provisioning Technical Documentation results. The value of the change is sometimes questionable.

- Additional types of the same functional components are introduced into the system by variance in design which results in a multitude of Federal Stock Numbers for the same

type of item. As an example of corrective action, smooth bore spare couplings were once stocked for various pumps and motors; now, by stocking rough bore couplings and having the ship turn them to fit, the need for stocking numerous items has been eliminated. In another instance, a new specification, invoking maximum standardization, requires only 13 stock numbers to cover all bi-metal thermometers, in lieu of the several hundred numbers previously required. Concentrated effort in standardization of many such items will help alleviate the Fleet's dilemma. Fruitful standardization results can be obtained, by the design and definitive specification route, in fractional horsepower motors, filters, electrical controllers, flexible connections, gages,

valves and shipboard laundry equipment.

Standardization

Would you believe standardization, or the lack thereof, in old and new ships?

Before delving into this topic, some pertinent terminology should first be identified.

- **Component Identification Number (CID)**—a nine-digit number for each component/equipment:

01	112	0012
Pump	Manufacturer	Sequential Serial Number

There are 99 groups involved (01-pumps, 02-boilers, 06-engines, 88 valves, etc.)

Descriptive Supplement Number

	Federal Stock Numbers	
	Before	After
• Purifiers (DSN2030)	82	43
• Doors, Hatches & Scuttles (DSN1310)	620	212
• Axial Fans (DSN1720)	1,375	300

Figure 4.

- **Allowance Parts List (APL):** A description of each component's electrical, mechanical and operating characteristics, and a listing of all repair parts applicable to the component using the component identification number.

- **Preliminary Allowance Parts List (P-APL):** An interim Allowance Parts List issued in cases of incomplete characteristics.

- **Coordinated Shipboard Allowance List:**

Part I—Summary of effective Allowance Parts Lists and an index of components or equipage groups.

Part II—Allowance Parts List for each component/equipment installed in the ship.

Part III—Stock Number Sequence Listing of each repair part in Part II that is coded for onboard.

Findings

In June 1965 the Navy Logistic Support Task, under Project Number V, stated in part, "Logistic support would be greatly improved by increased standardization and configuration control of systems and equipments. . . ."

There is an apparent direct tie-in with standardization programs for the Fast Deployment Logistics (FDL) ship and the new Landing Helicopter Assault (LHA) ship. The Naval Ships Systems Command (then Bureau of Ships) recommended to the Secretary of the Navy in September 1965 that "Equipment for new construction should conform to an established Allowance Parts List." Exceptions were:

- Existing Allowance Parts Lists don't meet specifications.

- Prohibitive cost could result.
- Technological advance would be deterred.

The Chief of Naval Material set up the Navy Component/Equipment Standardization organization and issued Task Number 1 in July 1966.

Growth of Allowance Parts Lists

New Allowance Parts Lists reflect equipments being added to the Fleet as follows:

36,000 added between 1963-1964.

16,000 added between 1964-1965.

11,000 added between 1965-1966.

5,800 between October 1966-April 1967.

It will be at least another 12 to 18 months before the impact of standardization will be felt since, although much of the equipment was procured early in the ship's availability, the Allowance Parts Lists are only now being prepared due to phased provisioning action.

The significant point is that from Oct. 1, 1963, to April 1, 1967, basic Allowance Parts Lists have grown from 112,500 to 168,000, about a 50 percent increase.

Component/Equipment Growth

To pinpoint some of the more significant components/equipments insofar as gross numbers are concerned, it can be seen in Figure 3 that, during the past three and one-half years, there has been a marked increase in the number of new components/equipments that has been introduced in Navy hulls, either during new construction, conversion, overhaul, or replacement by ships force.

struction, conversion, overhaul, or replacement by ships force.

It must be remembered that any significant deviation from an existing item of equipment, that has an existing Allowance Parts List, causes a new Allowance Parts List to be generated with all the related costs. The question is, what is significant? A prime example is an electric controller, wherein all the parts of the unit by the same manufacturer, are identical in a multi-number of models. The only difference is the thermal element (the heater strip). All the other parts (contacts, springs, relay, physical dimensions of box, etc.) are the same with only one occasional difference—a new model number on the label plate. By grouping similar controllers under one Allowance Parts List and having a select listing for ordering proper heater elements consistent with applications, i.e., horsepower/ampere range, there will be a gross reduction in the number of Allowance Parts Lists, definitely leading towards standardization.

A further review of Figure 3 indicates that the 11 groups of component identification numbers in 1967 represent about 50 percent of the total of 168,000 Allowance Parts Lists, that valves equal 25 percent of the total bank, with motors and controllers being about 10 percent each of the total.

Cause

What caused the growth of Allowance Parts Lists? Technological advances in hull, mechanical and electrical equipment has been limited,

Population of Hull, Mechanical and Electrical Component by Ship Application				
Ship Population	No. of APLs	No. of P-APLs	Total No. of APLs	Percent
100 or over	2,901	2	2,903	1.72
50 thru 99	3,185	2	3,187	1.90
10 thru 49	28,687	27	28,714	16.97
5 thru 9	26,631	62	26,693	15.82
4	11,780	150	11,930	7.10
3	16,493	465	16,948	10.04
2	28,259	1,397	29,656	17.57
1	36,520	12,225	48,745	28.88
Total	154,456	14,320	168,776	100.00

Figure 5.

especially in comparison with the field of electronics. There are two reasons that are believed to be the basic causes: competitive bidding; and performance specifications, in lieu of definitive specifications.

Cures

If the cure for new construction is to use only existing Allowance Parts Lists, certain corrective actions need to be taken by the Navy. Operation Purge is this author's approach and is the course of action outlined below, now under way at the Ship Parts Control Center and the Naval Ship Engineering Center's Mechanicsburg Division:

- Cancel all non-component worthy Allowance Parts Lists and duplicates. (Under way.)
- Conduct a manufacturers' review of all applicable Allowance Parts Lists to determine if the item is no longer manufactured or supported; if the item is no longer manufactured, but

supported; if duplications of equipment parts are completely interchangeable; and to designate the manufacturer's key identification number. (Copies of Allowance Parts List header [component characteristics] cards were sent to manufacturers of selected groups of component/equipment in April 1967 for their review.)

- Recapitulate reliability of both good and poor performance equipment based on usage data, using total installed population, ship type, and installed service application. (Under way on selected component identification groups—range and depth of Allowance Parts List will be updated as usage dictates.)
- Develop more Descriptive Supplement Numbers (DSN), likened to the old illustrated general stores catalog, for pumps, air compressor valves, etc. (Awaiting approval.) Figure 4 reflects accomplishment on some items where the DSN approach was employed.
- Delete Allowance Parts Lists for

common variety valves, two inches and under, that either have no repair parts or only gaskets and packing which could be part of the general stores material or load list. (A project is under way to completely mechanize 60,000 hand-written cards, giving 26 fields of all technical and supply data for all valves. The Naval Ship Engineering Center is sponsoring this project. It will provide necessary engineering data to eliminate duplications, group valves by manufacturer, type size, distance between faces, material, service use, submarine safety, etc.)

- Fully implement the Fleet Logistics Support Improvement Program for shipboard allowance policies (Chief of Naval Operations Instruction 4441.12) which will determine vital/non-vital components; provide military essentiality code, minimum replacement unit, and planned maintenance requirements for each repair part; update the Allowance Parts Lists; and update ships allowance. Maintenance levels are to be assigned to each repair part, indicating the authorized capability needed to install, repair and condemn, which will make the Allowance Parts List more than a supply aid. (Already under way, this operation will take about three years and will result in a complete manual review of all data and Allowance Parts Lists.)

- Delete component identification numbers and Allowance Parts Lists that should be either Allowance Equipage List or General Stores Material. (Under way.)

- A joint meeting was held with the planning officers and supply officers of all Naval Shipyards and two District Supervisors of Shipbuilding to discuss industrial ship repair problems. Each activity subsequently reported its most troublesome Allowance Parts Lists. (Ship Parts Control Center is reviewing the repair parts support for these components and will buy sufficient material in range and depth to support the yards.)

- Review Allowance Parts Lists for the purpose of purging part number items which were, over the years, procured as on-board repair parts, but not bearing Federal Stock Numbers were not procured for system stocks. Accordingly, requisitions received for such items are being filled by spot purchases. (These part numbers are now being reviewed by the Ship Parts

Active Fleet "Onesie" APLs			
CID	Name	Quantity	Percent of Total
01	Pumps	1,291	16
02	Boilers	60	18
03	Heat Exchangers	299	18
04	Condensers	195	19
06	Compressors	133	15
08	Distilling Plants	34	13
14	Circuit Breakers	687	17
15	Controllers	3,779	21
16	Generators	202	16
17	Motors	3,563	20
18	Motor Generators	82	15
19	Relays	304	19
21	Switches	1,663	20
32	Refrig. Equipment	443	21
33	Air Conditioning	70	35
34	Starters	26	9
40	Fans	359	21
43	Galley Equipment	366	19
61	Controls	837	16
66	Engines	107	12
78	Couplings	141	12
88	Valves	9,324	20
91	Laundry Equipment	153	22
	Other	24,627	—
	Total	48,745	—

Figure 6.

Control Center for: requirement to be on-board repair parts, existence of Federal Stock Numbers, obtaining required new Federal Stock Numbers, and procurement of system backup stocks.)

Existing Fleet

As a bit of interesting data on the population of hull, mechanical, and electrical components by ship application, Figure 5 shows that, of the total 168,776 Allowance Parts Lists applicable to active fleet ships, 107,279 (or 64 percent) are applicable to four or less hulls.

Twenty-nine percent of the 168,776 different types of equipment are installed in only one hull—"onesies." There may be more than one of the same component installed in the ship but that component, regardless of total number installed, is applicable to that ship only.

Figure 6 indicates the number of significant "onesies" applicable to the active Fleet. Also indicated is the percentage of the "onesie" item in relationship to the total bank of Allowance Parts Lists for the same component identification number group. Controllers, refrigeration equipment, motors, air conditioning equipment, fans, laundry equipment and valve "onesies" Allowance Parts Lists each average better than 20 percent of their respective total number of Allowance Parts Lists.

A review of the listing of single-hull application Allowance Parts Lists on active ships reflects the following average number of "onesies" per indicated ship type:

Destroyer tenders	(AD) ---120
Oilers	(AOE) ---599
Repair ships	(AR) ---182
Submarine tenders	(AS) ---395
Attack aircraft carriers	(CVA) --392
Destroyer leaders	(DL) ---101
Guided missile destroyers	(DLGN) 613
Nuclear submarines	(SSN) --115
Ballistic missile nuclear submarines	(SSBN) --35

Less than 10 percent of the active Fleet has 50 percent of the "onesies" installed.

Conventional destroyer types, built during World War II, do not present a problem in single-hull application. A comprehensive study, conducted by

Submarine Force, Atlantic Fleet, of ballistic missile nuclear submarine logistics, based on a commonality index, developed the various aspects of standardization or lack thereof.

A detailed study, known as Chief of Naval Material Standardization Task Order Number One, is seeking to phase out single-hull application components and equipments and to replace these with high population, reliable, multi-hull application items, based on a life cycle cost effectiveness trade-off of replacement versus repair. The outcome of the test ships now in overhaul will provide useful data in determining what can be done with "onesies." One of the factors being considered is what can be saved by elimination of Federal Stock Numbers. This, however, should not be the only consideration regarding savings from spare parts as there are also manufacturer part-numbered items involved, which are the most costly repair items, that are encountered during major overhauls.

A complete listing of single-hull application of components/equipments for the Fleet was sent by the Ship Parts Control Center to all fleet type commanders and naval shipyards on March 15, 1967, to assist in the Navy's efforts in reducing the number of "single" Allowance Parts Lists



Capt Carl B. Ihli, USN, is assigned as Engineering Assistant to the Commanding Officer of the Ship Parts Control Center, Mechanicsburg, Pa., and has additional duty as Officer in Charge, Naval Ship Engineering Center, Mechanicsburg Division. A major portion of his Navy career has been associated with the maintenance problems of the active and reserve fleets.

whenever consideration of the economics of replacement, during repairs, deems it prudent.

Goals

What is the goal for new construction? The answer is, standardization within a class and within a ship's hull.

The continual introduction of supposedly new items requires the costly processing of the Provisioning Documentation and the development of new Allowance Parts Lists at an average administrative cost of \$1,000 each. The introduction of new Federal Stock Numbers into the system, at a yearly administrative cost of \$100 per item, averages one and one-half new Federal Stock Numbers per new Allowance Parts List.

In addition, the ship has to carry a greater range of spares and, in some cases, this poses a serious space problem, especially if there is a large variety of the same component.

Last, but not least, the training of fleet personnel in the operation, maintenance and repair of the equipment is not as complex when there are few models with which to contend.

How is standardization attained? The answer to this question is to point out to the shipbuilder how he loses money when he buys a variety of equipment for the same application within the hull and, more important, when he buys a new item, with all its related plans, technical manuals, and other documentation, that is not required if an existing Allowance Parts List component is procured that is identical.

In some cases the cost of totally new documentation is more than twice the cost of the new component. With a bank of an estimated 100,000 Allowance Parts Lists that are reliable, high-population items, it would seem very prudent and wise to review these available equipment models to determine suitability to all requirements before introducing a new similar item.

The courses of action that are being taken, some of which have been highlighted in this article, by the engineering and supply members of the Navy team, in understanding and mutually attacking the equipment and spare parts problem, should do much to erase the Fleet's spare part dilemma.

The Defense Market System

Lieutenant Colonel David I. Cleland, USAF
First Lieutenant William R. King, USAF

[Editor's Note: This article is adapted from a book by the authors titled, "Systems Analysis and Project Management" to be published by McGraw-Hill Book Co., in early 1968.]

The Defense Department is the largest single customer of the American industrial complex. Private industry, under government control, develops and produces our major weapon systems. As a result, the magnitude and scale of the defense market,¹ unlike the civilian consumer market, is shaped by long-range planning in the Government.

The Federal budget plays a primary role in determining the direction defense buying will take. Military expenditures are authorized as the result of continued interaction of many demands and requirements, not only of the defense sector of the economy but also of non-defense programs and policies. There are unique risk and uncertainty factors in the market for defense goods; other markets, while not as singular as the defense market, do have characteristics similar to those of the defense market. For example, the market for industrial goods (goods which are used in producing consumer goods, e.g., machine tools) and the construction market have some of the same facets of defense buying and selling. One such aspect is that the purchasing process is consummated with a formal contract, after bids have been submitted and terms have been negotiated.

However, in the defense market, the financial and managerial risks of the contractor center around a small number of ventures. It is this en-

¹For our purposes, a market is defined as a place where buyers and sellers exchange a commodity or a service.

vironment in which project management techniques had their genesis and where these techniques have become well accepted.²

In the defense market, the actual exchange of the product, e.g., the weapon system, takes place long after the contract for it has been consummated. There is, however, something more complex in the producer-consumer relationship in this market than just a contractual agreement.

A defense producer begins the study development phase of the work well in advance of the Government's request for a contractual bid. Companies in the defense industry are constantly studying and evaluating the military market, hoping to determine the direction military technology will take. Frequently, unsolicited proposals are submitted to the Government. Hence, dependent relationship exists between the Government and the defense industry long before (and after) a defense contract is signed. The involvement between DOD and a defense contractor develops into a bilateral monopoly market and the Government's dependence on a given contractor to fulfill the commitment increases the risk and uncertainty factors.³

²See Cleland, David I., "The Project Manager—Manager Extraordinary," Defense Industry Bulletin, May 1965.

³A bilateral monopoly, in economic terms, is a one-buyer-one-seller relationship, whereas the relationship in the consumer goods market is more typically one involving a few sellers (or many sellers) and many buyers. Bilateral monopoly arises when a single seller deals with a single buyer—there is a high degree of interdependency; one cannot survive without the other.

The salient characteristics of the defense and consumer markets in the United States may be summarized as shown in Figure 1 (page 8).

The consumer market operates on the basis of supply and demand which involves some risks and uncertainties. However, even though a vast proportion of new consumer products become marketing failures,⁴ the scope of the risks and uncertainty do not compare with those to be found in the defense industry.⁵ The financial outlay required for research, capital equipment, and unique test facilities to develop a weapon system is frequently of such magnitude that a private company could not afford to do it alone. The Government has recognized this and often supports these efforts by providing industrial facilities, advance and progress payments, and assistance in acquiring strategic materials.

⁴For example, it has been estimated that 80-90 percent of newly introduced packaged grocery products are marketing failures. See Hilton, Peter J., "New Product Introduction for Small Business Owners," Small Business Management Series, No. 17, U.S. Government Printing Office, Washington, D.C.

⁵Peck and Scherer have defined the uncertainties of the weapons acquisition process as being of two broad classes:

- Internal uncertainties relating to unforeseen technical difficulties in developing a specific system.

- External uncertainties having to do with technological changes in weaponry, changes in strategic requirements, and shifts in government policy.

See Peck, Merton J., and Scherer, Frederick M., "The Weapons Acquisition Process: An Economic Analysis," Harvard University, 1962, (Chapter 2).

Consumer Market	Defense Market
Seller provides initiative for producing products. The basis for his decision is an analysis of the potential market, but he has no certain knowledge of the product's salability.	Buyer establishes the requirement for the product after which the producer formally begins development and production.
Production for inventory made necessary by differences in economies of aggregation at producer and retail levels. (These differences in the economies of aggregation simply mean that producers find it economic to manufacture in large quantities while retailers desire small quantities of wider varieties of products.)	Production for immediate use.
Many homogenous products; buyer has a wide range of choice. There is some real or imagined product differentiation.	Relatively few heterogenous products are produced. The buyer has a choice, but the time and cost of bringing the substitute into fruition precludes any real meaning to the idea of substitutability.
Price is a dominant factor in choice because adequate and competing substitutes are often available.	Price is only one of many factors including quality, availability, and technology to support a specific military requirement.
The operation of the market is somewhat impersonal; it is the aggregate of the wants and needs of many buyers and sellers acting independently.	Market system is personal; the buyer's agent becomes deeply involved with the seller's organization. The market place centers around a few buying agencies operating under executive control of DOD.
The producer finances the development-production effort himself.	In the main the buyer finances most of the development and may provide equipment and facilities for the producer to use.
The market is characterized by monopolistic competition.	Market is essentially one-customer. Although different agents are involved, they all function under uniform policies and procedures of DOD.
Prices for the most part are determined by competition in the usual economic sense.	The price is determined by an evaluation of expected and actual costs. Significant competition may occur between a few producers before the final producer is chosen.
Relatively insensitive to domestic and international politics.	Highly sensitive to domestic and international politics and intrigue.
Demand is either relatively constant (e.g., for staples) or tends to be a function of income (e.g., for non-essentials).	Demand is a function of the technology offered by the seller or our nation's estimate of that possessed by the potential enemy. Scientific achievement may be a major requirement.
Requirements for a given model are relatively stable. Model changes affect demand, but the basic utility of the product changes slowly.	International tension can cause requirements to fluctuate rapidly and violently. The product may be obsolete in terms of military technology as soon as the prototype is produced.
Little or no price negotiation is carried on; the product is offered at a price that is met or not, depending on individual consumer motivation. With a wide range of alternatives, the consumer elects an alternate source rather than haggle over prices.	The price is negotiated, in the main, with selected suppliers chosen by the buyer. The defense customer of a large weapon system normally requests proposals from the producers capable of developing and producing one.

Figure 1.

The nature of the uncertainties is also different in the two markets. Even though consumer acceptance is better defined in the defense market, rapid product obsolescence, changes in military demand and Defense Department management philosophies, high technological risk (a continual widening of the state of the art), the vagaries of potential enemy behavior, all contribute to great uncertainty. These risk factors, when combined with changes in managerial and organizational relationships, create an environment substantially different from that found in the consumer goods market.

Perhaps the greatest difference between the consumer market and the defense market is the buyer-seller interdependency and the organizational involvement this entails. Although there are many "agents" representing the Government, these agents operate under standard policies of the Defense Department. The result is a one-buyer-one-seller relationship in a joint venture extending throughout the life cycle of the system or project.

Thus one cannot today look at the defense industry environment and assume transferability of characteristics, policies, and *modus operandi* from the consumer goods industry. There are different forces and motivations in the two markets which serve to differentiate them in ways that are both obvious and subtle.



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However, one essential element of the two markets may serve to lessen their differences in the future. That element, formal planning, is exemplified by the management theories and techniques, such as systems analysis, systems project management, planning-programming-budgeting, to name a few, which have been implemented under Secretary of Defense McNamara. The benefits achieved through these innovations have led to the introduction of these modern management approaches in other government departments, as reflected in President Lyndon B. Johnson's directive in 1965, "... to immediately begin to introduce a very new and a very revolutionary system of planning and programming and budgeting through the vast Federal Government."⁶

Concurrent with these government resolutions in management have been similar changes in business and industry. The advances in technology and the increased complexity of a "demand creation" economy have outmoded many of the management theories and techniques which were developed for a "demand satisfaction" environment.⁷ Recognizing this, industry has applied many of the same modern management ideas. This has

⁶ As reported in *Time*, Sept. 3, 1965, p. 20.



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resulted in increased emphasis being given to formal planning at all levels of business and industry.⁸

The ideas of formal planning, together with project (systems) management techniques, have demonstrated their utility in a wide variety of organizational environments. In the future these techniques will be extended to such areas as urban renewal programs,⁹ transportation systems, and such related endeavors. Increasingly, these programs will have aspects of both business and government activities. Indeed, many of them will be performed on joint bases which involve elements of both the consumer and defense market systems. As these activities become more predominant, a new market system may begin to evolve.

⁷ An important element of U.S. business has traditionally been the production and distribution of goods for which there existed a large unsatisfied demand. The affluence of today's U.S. consumer means that most of his basic needs are easily met. The primary marketing function in such a situation is to convince the consumer that he needs a product and then to supply it to him, i.e., to "create" a demand in the mind of the consumer which is then fulfilled.

⁸ See Warren, E.K., "Long Range Planning: The Executive Viewpoint," Prentice-Hall, Inc., 1966.

⁹ See Herrmann, Cyril C., "Systems Approach to City Planning," *Harvard Business Review*, September-October, 1966.

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Managing the Value Engineering Program

George E. Fouch

Industry managers share with DOD managers the responsibility for managing an effective value engineering program in connection with defense contracts. Value engineering staunchly supports the management objective of the Defense Department. It is, moreover, a proven management tool that can be used to avoid the expenditure of a great amount of dollars without any degradation of performance, reliability, or quality requirements.

Soon after the value engineering concept was introduced in the General Electric Co., it was recognized that the concept could significantly contribute to a manager's effectiveness. The vast scope of DOD operations, both in-house and with defense contractors, provides an almost infinite number of opportunities for a rewarding application of value engineering. Because of the hundreds of thousands of individuals, representing many professions and skills, whose work interfaces with value engineering opportunities in our defense programs and projects, the effective management of the DOD Value Engineering Program is no ordinary task. The understanding and cooperation of these many people are needed so that all of our resources are used more efficiently.

The purpose of this article is to achieve better understanding among our contractor and DOD managers as to how value engineering can contribute to a contractor's competitive position and profit, as well as to the economic achievement of our defense management objectives. Accordingly, this article is written in the hope of realizing a multiplier effect in spreading a better understanding of value engineering throughout the defense industry and DOD. It will cover three aspects of the value engineering program:

- Benefits often realized through value engineering other than reduced costs.
- Value engineering cost reduction achievement in FY 1967.
- Facts relating to contractor-initiated value engineering change proposals.

Total Effectiveness of Value Engineering

In May 1964 a technical subcommittee of the American Ordnance Association (AOA) published a widely circulated report entitled, "Fringe Effects of Value Engineering." Those who are well read on value engineering have probably seen this report. A similar AOA study, broader in scope and entitled, "Total Effectiveness of

Value Engineering," has just been completed. The results of this study, like the Fringe Effects study of 1964, again show that value engineering not only reduces costs but also frequently improves the product in many other important aspects. The conclusions from both of these studies show that value engineering is a discipline which permits the manager to achieve reduced costs and, at the same time, realize gains in reliability, quality, performance, producibility and maintainability. What clearer confirmation of additional value could one ask?

Figure 1 portrays the results of the first phase of the 1969 AOA value engineering total effectiveness study of some 193 approved value engineering changes that were implemented by defense contractors. It can be seen that in 63 percent of the changes made re-

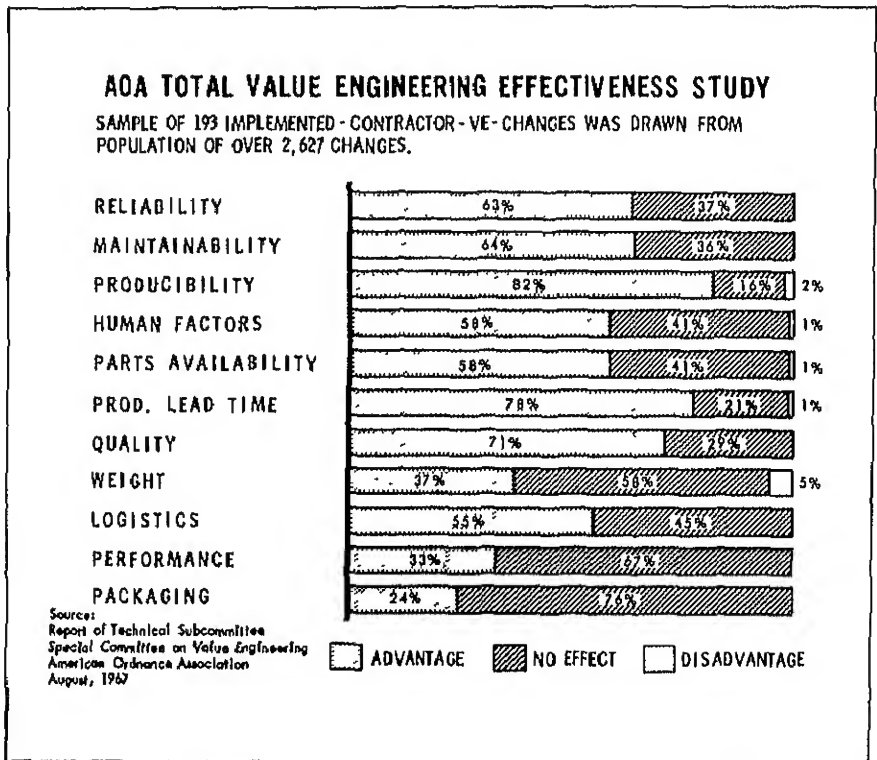


Figure 1.

liability was increased; maintainability was improved in 64 percent; quality was raised in 71 percent; performance of the item was improved in 33 percent; and weight was reduced in 37 percent of the cases. The effects on the characteristics studied, all generally favorable, are evidence of the effectiveness of sound value engineering application.

The more aggressive technical managers in the Government and industry are aware of these added benefits of sound value engineering actions. Managers in other nations are also

catching on. For example, in a technical paper printed in the February 1967 issue of the *Journal of the Royal Aeronautical Society*, J. R. Ewans emphasized the weight savings achieved by value engineering. Fifty-three percent of the value engineering proposals at British Aircraft Corp. had a most pleasing result of a weight reduction, in addition to the cost reduction. The point is that, in recent years, managers in other nations have realized similar profitable experiences from their value engineering efforts.

The total effectiveness characteristics of value engineering have been presented much as one might briefly describe the performance characteristics of an airplane. For example, the take-off distance is X thousand feet, the landing distance is X thousand feet, the service ceiling is X thousand feet, etc. These performance characteristics are important but, if the airplane is a bomber, the primary concern is whether the aircraft can deliver the bombs on the target. In value engineering the acid test is whether the concept can, in practice, satisfy the required function at reduced cost. Does it deliver cost reduction results? The answer is an emphatic yes.

Value Engineering Results in FY 1967

Validated value engineering cost reduction results in FY 1967 again exceeded the established FY 1967 goal. It was considered that the FY 1967 goal was a more difficult goal than for prior years because previous years' results were not carried over. The actual accomplishments are shown in Figure 2. These reported savings are those resulting from new actions taken during FY 1967. Those who cooperated are to be congratulated for the contribution made by their organizations to this outstanding achievement. Accomplishment of savings from new actions generated in FY 1967 was \$339 million against a goal of \$300 million. When adding the estimated cost savings to be realized in FY 1968 and FY 1969, stemming from these new FY 1967 actions, the three-year accomplishment totals \$609 million. This sum exceeds the FY 1967 through FY 1969 goal of \$419 million by \$190 million.

The investment made in terms of our efforts has produced a substantial reward for DOD, but we have only begun to exploit the full value engineering potential.

Contractor Value Engineering Change Proposals

The Office of the Assistant Secretary of Defense (Installations and Logistics) analyzes savings from approved contractor-initiated engineering change proposals which lead to a change

*VE GOALS FOR FY 67 AND ESTIMATED RESULTANT SAVINGS FROM FY 67 ACTIONS FOR FY's 68 AND 69

	FY 67		FY 68		FY 69		FY 67-69	
	Goal	Accomp.	Goal	Accomp.	Goal	Accomp.	Goal	Accomp.
ARMY	\$102	63	\$30	49	\$10	25	\$142	137
NAVY	69	119	21	23	7	14	97	156
AIR FORCE	117	130	35	54	12	52	164	236
DSA	12	14	3	9	1	8	16	31
TOTAL	\$300	\$326	\$89	\$135	\$30	\$99	\$419	\$560

GOAL
 ACCOMPLISHED

\$ In Millions

* Supplemental savings report forthcoming because of backlog in process of audit validation.

Figure 2.

VECPs APPROVED

	FY 1966	\$ Value	FY 1967	\$ Value
Army	435	13.4	354	14.0
Navy	304	8.2	255	4.3
Air Force	210	25.3	138	19.1
Defense Supply Agency	33	0.2	55	1.1
DOD TOTAL	982	\$47.1	802	\$38.5

\$—Estimated value in millions savings to the DOD.

Figure 3.

tract, as well as a savings reported in the DOD Cost Reduction Program. Results from these analyses indicate that all that glitters is not gold. Reviewing the contribution to our total value engineering savings, generated by defense contractors through the VECF route, we see in Figure 3 that savings to DOD from VECFs in FY 1967 declined in numbers and dollars compared to FY 1966 results. The total reported VECF savings to the Government in FY 1967 was \$38.5 million compared to \$47.1 million in FY 1966.

It is necessary to explain the \$47.1 million in VECF savings for FY 1966, and a figure of \$36 million that was published at the end of FY 1966. The explanation is simply that \$36 million was reported as of the cutoff date of the FY 1966 report, but did not include \$11 million in savings from FY 1966 value engineering actions that were later submitted in a supplemental report. Savings of \$36 million had been published but later an added "dividend" of \$11 million was found. The decrease in number of VECFs from 982 in FY 1966 to 802 in FY 1967 can be seen. The facts then boil down to a lesser achievement in 1967 than in 1966.

The Class I value engineering activity of our many contractors is also monitored. Each high-dollar Class I VECF, submitted with total estimated savings of \$50,000 or more before sharing, is reviewed quarterly. This review gives a good indication of those contractors who have been motivated to do effective value engineering. It also gives an indication of the contractors who have not yet been motivated to initiate value engineering effort.

To briefly analyze some results of contractor value engineering activity, Figure 4 indicates FY 1967 results from 34 of our major contractors who produce defense systems and hardware. Eight of these contractors, as a result of high-dollar VECFs, reported savings to DOD amounting to \$21.3 million. This is about 45 percent of the total estimated savings for FY 1967 from all VECFs. One of these contractors produced savings to DOD of \$5 million, another \$4.5 million. The contractors' incentive sharing of these top VECF producers ranged from approximately \$400,000 to \$2 million. Incentive shares to contractors for successful VECFs are

ESTIMATED SAVINGS TO DOD FROM CLASS I VECFs** SUBMITTED BY EIGHT MAJOR DOD CONTRACTORS FY 1967

Contractor	Savings to the DOD (Millions)
1	\$ 5.0
2	4.5
3	3.0
4	2.7
5	2.0
6	1.8
7	1.2
8	1.1
	<u>\$21.3*</u>

* 45 percent of total VECF savings to the DOD in FY 67.

** High dollar VECFs with estimated total savings at least \$50,000 before sharing.

Source: DOD VECF Reports—FY 67.

Figure 4.

MAJOR CONTRACTORS PRODUCING NO SAVINGS TO THE DOD FROM CLASS I VECFs* IN FY 67

Contractor	VECF Savings to DOD	Contract Awards (Millions)
1A	\$0	\$ 930.
2A	0	792.
3A	0	506.
4A	0	337.
5A	0	273.
6A	0	233.
7A	0	172.
8A	0	150.
Total	<u>\$0</u>	<u>\$3,393.</u>

*High dollar VECF is one with estimated savings at least \$50,000 before sharing.

Source: DOD VECF Reports—FY 67.

Figure 5.

***HIGH DOLLAR CONTRACTOR VECPS
APPROVED BY MILITARY DEPARTMENTS
(34 MAJOR DOD CONTRACTORS)
FY 1967**

Military Department	No. VECPs Approved	Savings to the DOD (Millions)	Contract Awards (Billions)	Percent of Contract Awards Saved
X	47	\$ 3.3	\$ 6.0	1/18 of 1%
Y	7	2.5	4.8	1/19 of 1%
Z	30	12.7	2.7	1/2 of 1%
Totals	84	\$18.5	\$13.5	1/7 of 1%

*A VECP with total estimated savings before sharing of at least \$50,000.

Figure 6

awarded only after a greater savings accrues to the Government. On the average, including all types of sharing arrangements, the VECP dollar has been divided 70 cents to DOD and 30 cents to the contractor.

Looking a bit deeper, in Figure 5 it can be seen that in contrast to the best eight contractor VECP performers, the eight poorest performers, with over \$3 billion in DOD business, produced exactly zero in high-dollar VECP results last year. How much unnecessary cost was incurred because these eight contractors alone were not motivated to perform in the Class I VECP area? Total FY 1966 contract awards by the Military Departments to the 34 contractors studied amounted to about \$13.5 billion.

From another perspective of VECP performance, the Military Departments approved a total of 84 high-dollar VECPs from the contractors studied. Figure 6 shows that resultant savings to the Government from \$13.5 billion in contract awards were \$18.5 million.

It is necessary, then, that principal DOD managers wholeheartedly emphasize value engineering in their contracts with their contractor counterparts. Extraordinary emphasis may be necessary at the outset to overcome adverse impressions left by months of neglect or lack of understanding of the nature and mutual opportunities presented in the value engineering program. We want to assure the defense contractor that we are sincere in inviting submittal of sound VECPs for thorough consider-

ation, we will give prompt informative decisions, and we are truly willing to authorize incentive payments where earned. We realize that the contractor must be assured of this fair climate for risking his investment in proposal costs for, after all, when his proposal is disapproved, he gets nothing for his investment.

In summary, your attention has been invited to the total effectiveness of value engineering in producing significant collateral benefits in addition to cost savings. This attribute, as borne out by the AOA value engineer-



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ing study, is one that any prudent manager will keep in mind.

Information on the validated contribution of the FY 1967 value engineering program savings to DOD has been given and this year's accomplishment is solid evidence that, collectively, contractor and DOD managers are producing increasing value engineering results.

Management of and participation in the DOD value engineering effort is a rewarding and enjoyable experience, and the methodology is a proven one. The results are measured both in dollars and added benefits in the accomplishment of our prime objective, namely, the effective support of our combat forces in the field, and progress is followed through an established DOD quarterly reporting system.

Who has yet held a management job involving a number of people that is always easy to perform with high efficiency. But one thing is certain. If the effort is not made, the genuine satisfaction of joint productive results will never be realized.

Aerospace Center Approved for USAF Academy

Plans to create an Aerospace Education Center at the Air Force Academy have been approved by the Department of the Air Force.

The center is being planned by the Air Force Academy Foundation, founded initially by a group of public spirited Colorado citizens in lieu of an Academy alumni group during the school's early years.

The proposed \$8 million Aerospace Education Center will bring together military and civilian groups to study national and international programs in the environments of air and space. The facility will be designed to meet the specific requirements of conferences, symposia, seminars and similar gatherings and will accommodate up to 1,000 persons.

It is anticipated that start of construction may be possible in 1969.

When completed by the Academy Foundation, the center will be turned over to the Air Force for operation under guidance of the Air Force Academy Aerospace Education Association.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

The appointment of Maj. Gen. Richard P. Klocko, USAF, as Dir., Defense Communications Agency, with concurrent promotion to the grade of lieutenant general, became effective Nov. 15.

Dr. Eberhardt Rechtin of the Jet Propulsion Laboratory, California Institute of Technology, has been named Dir. of the Advanced Research Projects Agency (ARPA). He succeeds Dr. Charles M. Herzfeld who has accepted a position in industry. As Dir. of ARPA, Dr. Rechtin will be responsible for planning, initiating and directing specific research and development programs as assigned by the Dir., Defense Research and Engineering.

DEPARTMENT OF THE ARMY

Brig. Gen. Wilson R. Reed, formerly Dep. Secretary of the General Staff, Department of the Army, has assumed command of the Automatic Data Field Systems Command, Fort Belvoir, Va. He replaces Brig. Gen. Roger M. Lilly who has been assigned as Commanding General, 2nd Region, Army Strategic Communications Command, Richards-Gebaur AFB, Mo.

Brig. Gen. Robert B. Terry is the new Commanding General, U. S. Army Strategic Communications Command, Pacific.

New assignments in the Office of the Chief of Research and Development include Col. Walter E. Rafert, Asst. Dir. of Developments; Col. Wilbur H. Vinson Jr., Chief, Nike-X and Space Div.; and Col. John J. Doody, Chief, Test and Evaluation Branch, Management and Evaluation Div.

Arsenal has as-
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bilization planning and procurement program of Edgewood Arsenal.

Recent assignments at the U. S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md., are: Col. Raymond E. Johnson, Dir., Aviation Materiel Testing; Col. John P. Wheeler, Dir., Armor Materiel Testing; Col. William D. Meara, Chief, Test Analysis and Operations Office; and Lt. Col. Robert B. Tully, Chief, Infantry Materiel Testing Directorate.

DEPARTMENT OF THE NAVY

The President has nominated VAdm. Bernard A. Clarey, who has been serving as Dir. of Navy Program Planning, for appointment to the position of Vice Chief of Naval Operations and promotion to the grade of admiral. He relieves Adm. Horacio Rivero Jr. who has been named to succeed Adm. Charles D. Griffin as Commander in Chief, Allied Forces, Southern Europe.

RAdm. Edwin B. Hooper, formerly Commander, Service Force, Pacific, has been designated Asst. Dep. Chief of Naval Operations (Logistics). His replacement in the Pacific command is RAdm. Walter V. Combs Jr.

RAdm. Leo B. McCuddin has been appointed Commandant, Twelfth Naval District. He relieves RAdm. William H. Groverman who has been serving as both Commandant of the District and Commander, Western Sea Frontier.

Capt. George R. Shepard, CEC, has relieved retiring Capt. Thomas E. Barnett, CEC, as Commanding Officer of the Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill.

DEPARTMENT OF THE AIR FORCE

The Air Force has announced the following general officer promotions: To major general:

Brig. Gen. William B. Martensen, Commander, 1st Strategic Aerospace

Div., Vandenberg AFB, Calif.; Brig. Gen. Guy H. Goddard, Dep. Dir. for Construction, Office of Dep. Chief of Staff, Programs and Resources, Hq., USAF; Brig. Gen. Joseph R. DeLuca, Dir. of Supply, Air Force Logistics Command, Wright-Patterson AFB, Ohio; and Brig. Gen. William G. Moore Jr., Dir., Operational Requirements and Development Plans, Office of Dep. Chief of Staff, Research and Development, Hq., USAF.

To brigadier general:

Col. Augustus A. Riemony, Dir., Materiel Management, Ogden Air Materiel Area, Hill AFB, Utah, who will assume the position of Dir. of Supply and Services, Office of the Dep. Chief of Staff, Systems and Logistics, Hq., USAF, effective Feb. 1; Col. David S. Chamberlain, Dep. Chief of Staff, Civil Engineering, Tactical Air Command, Langley AFB, Va.; Col. Archie S. Mayes, Dep. Chief of Staff, Civil Engineering, Pacific Air Forces, Hickam AFB, Hawaii; and Robert A. Duffy, Dep. for Reentry Systems, Space and Missile Systems Organization, Norton AFB, Calif.

In Air Force Logistics Command headquarters, Brig. Gen. Robert A. Berman has been reassigned from duty as Dep. Dir., Maintenance Engineering, to Comptroller. He replaces Brig. Gen. Frederick E. Morris Jr. who was named Commander of the new Advanced Logistics Systems Center at Wright-Patterson AFB, Ohio.

Col. Edwin F. Sweeney has been assigned as Dep. Dir. for Technical Services, Office of Space Systems, Office of the Secretary of the Air Force.

New assignments in the Air Force Systems Command include: Col. Marvin E. Carver, Chief, Flight Test Div., Research and Development Center, Griffis AFB, N.Y.; Col. Walter W. Sanders, Dep. Dir., Communications Satellite Systems Program Office, Space and Missile Systems Organization, El Segundo, Calif.; and Col. Raymond J. Disher, Commander, Test Site Office, Patrick AFB, Fla.

Aviation-Electronics Conference To Be Held at Fort Monmouth, N.J.

Scientists and engineers have been invited by the Army Electronics Command, Fort Monmouth, N.J., to submit papers on the subject of aviation-electronics for inclusion on the program of a symposium for industry to be held March 5-7, 1968, at Fort Monmouth, N.J.

The three-day conference will include a briefing on the research and development activities of the Electronics Command and will feature the presentation of selected papers.

Papers, which should be classified no higher than Confidential, will be accepted from or credited to non-profit institutions only.

A selection committee, consisting of Electronics Command personnel, will review and select papers for presentation and publication.

Deadline for submission of papers is Feb. 20.

Information about the conference or about details concerning the submission of papers can be obtained by contacting:

J. F. X. Mannix
Chief, Technical Industrial Liaison
Office
Headquarters, Army Electronics
Command
Fort Monmouth, N.J. 07703
Phone (201) 535-2240

AVCOM Publishes Revised Purchasing Guide

The U.S. Army Aviation Materiel Command (AVCOM), St. Louis, Mo., has published a newly revised and updated edition of its information brochure, "Doing Business with AVCOM," which is designed for use by prospective contractors.

The pamphlet provides a ready source of information for firms which have not previously held government production contracts and points out the numerous opportunities open to qualified business concerns.

The 27-page booklet can be obtained from the Army Aviation Materiel Command, Mart Building, 12th and Spruce Streets, St. Louis, Mo. 63103.

Seminar Schedule Set for Government Property Administrators

Three-day seminars for instructing government property administrators have been scheduled in each of the Defense Contract Administration Services Regions (DCASRs) of the Defense Supply Agency. The seminars will cover recent changes in the Armed Services Procurement Regulation (ASPR) relative to improved management of government-owned industrial property used for defense contracts.

Although these seminars are being conducted primarily to train government property administrators, contractor personnel are being afforded the opportunity to attend the seminars.

Seminars have already been held in San Francisco, Los Angeles, Boston and New York. Following is the schedule of upcoming seminars:

Jan. 8-10, 1968
DCASR Philadelphia
2800 S. 20th St.
Philadelphia, Pa. 19101

Jan. 22-24, 1968
DCASR Atlanta
3100 Maple Drive NE
Atlanta, Ga. 30305

Feb. 5-7, 1968
DCASR Cleveland
1367 E. Sixth St.
Cleveland, Ohio 44114

Feb. 19-21, 1968
DCASR St. Louis
1136 Washington Ave.
St. Louis, Mo. 63101

March 4-6, 1968
DCASR Dallas
500 S. Ervay St.
Dallas, Tex. 75201

March 18-20, 1968
DCASR Chicago
O'Hare International Airport
P.O. Box 8758
Chicago, Ill. 60666

March 27-29, 1968
DCASR Detroit
1580 E. Grand Blvd.
Detroit, Mich. 48211

The revised regulation provides for separation and clear identification of the responsibilities of contractors and government property administrators. In the future, each contractor will have written into his contract exacting requirements for receiving, accounting for, maintaining and disposing of government-owned equipment or materials for a defense contract. For government property administrators, the regulation outlines an efficient systematic basis for surveying and evaluating a contractor's property control system.

Defense contractors, who want more information on these seminars, may contact the Chief, Industrial Materials Support Division, in the nearest DCASR office. Names and telephone numbers are as follows:

Anthony Welsh
DCASR Philadelphia
Phone: (215) 271-3571

Henry Richter
DCASR Atlanta
Phone: (404) 261-7310, Ext. 466

Robert Goring
DCASR Cleveland
Phone: (216) 522-5394

Raymond Fancher
DCASR St. Louis
Phone: (314) AMhurst 8-6373

Clifford Hamilton
DCASR Dallas
Phone: (214) RIVerside 9-2376

Leroy Anderson
DCASR Chicago
Phone: (312) 694-3031, Ext. 2244

Jay Iskow
DCASR Detroit
Phone: (313) 923-0100, Ext. 491

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	I 1967	Apr	May	Jun	II	Jul	Aug	Sept	III	Oct
I. Military Prime Contract Awards														
Aircraft	\$ 1,945	\$ 2,989	\$ 2,696	\$ 2,262	\$ 2,102	\$ 432	\$ 1,240	\$ 1,377	\$ 3,049	\$ 394	\$ 636	\$ 1,483	\$ 2,513	\$1,249
Missile & Space Systems	1,040	987	1,314	861	1,230	300	260	606	1,166	535	521	524	1,580	323
Ships	355	491	876	239	679	72	129	206	107	178	104	135	417	153
Weapons & Ammunition	555	1,486	692	940	818	279	518	972	1,769	92	415	597	1,104	454
Electr. & Com- munications Eqpt.	918	1,574	666	915	971	480	338	1,030	1,848	169	364	283	816	272
Other Hard Goods	843	1,842	660	1,029	915	298	362	904	1,564	202	355	238	785	252
Soft Goods	709	922	1,078	939	638	171	199	282	652	588	280	188	1,056	175
Construction	207	392	198	150	232	126	160	340	626	56	100	76	232	56
All Other	1,406	1,963	2,356	1,639	1,605	517	507	963	1,987	1,194	568	573	2,335	522
Total (Excl. of work outside U.S.)	7,978	12,646	10,536	9,024	9,190	2,675	3,713	6,680	13,068	3,408	3,343	4,087	10,838	3,456
Total, Seasonally Adjusted	8,703	10,144	10,716	10,149	10,171	2,920	4,121	3,626	10,667	3,610	3,686	3,665	10,961	3,665
Work Outside U. S.	521	1,195	856	672	453	227	228	379	834	314	382	195	891	193
II. Gross Obligations Incurred														
Operations	8,326	9,604	10,426	9,702	10,229	3,664	3,531	4,239	11,435	3,700	3,885	3,689	11,224	
Procurement	4,374	8,539	5,368	5,276	5,113	1,801	2,485	4,663	8,948	1,045	1,894	3,215	6,154	
Other	2,429	3,470	3,453	2,230	2,519	726	1,130	1,553	3,510	1,246	1,062	1,112	3,420	
Total	15,129	21,613	19,247	17,208	17,861	6,191	7,146	10,555	23,893	5,991	6,790	8,016	20,798	
III. Gross Unpaid Obligations														
Outstanding														
Operations	3,828	3,777	4,792	5,024	4,644	4,761	4,765	4,513	4,513	NA	5,115	5,267	5,267	
Procurement	18,023	22,119	22,736	23,173	22,780	22,613	22,947	25,248	25,248	NA	23,874	24,925	24,925	
Other	5,747	7,392	8,179	7,888	7,626	7,453	7,628	8,270	8,270	NA	8,559	8,722	8,722	
Total	27,598	33,288	35,707	36,085	35,050	34,827	35,340	38,031	38,031	NA	37,548	38,914	38,914	
IV. Net Expenditures														
Operations	7,689	9,076	8,968	9,087	10,002	3,416	3,335	3,980	10,731	2,898	3,722	3,382	10,001	3,641
Procurement	3,651	3,886	4,392	4,264	5,074	1,783	1,850	1,649	5,282	2,037	1,982	2,041	6,060	2,005
Other	2,757	2,647	2,484	3,092	3,179	918	749	334	2,001	1,231	383(R)	933(R)	3,047(R)	789
Total	14,097	15,609	15,844	16,443	18,255	6,117	5,934	5,963	18,014	6,166	6,587(R)	6,356(R)	19,108(R)	6,435
V. DOD Personal Compensation														
Military	3,181	3,249	3,551	3,606	3,624	1,230	1,196	1,220	3,646	1,310	1,260	1,272	3,842	768(p)
Civilian	1,937	2,015	2,105	2,135	2,170(R)	700	776	772	2,248	736(R)	793	742(p)	2,271(p)	
Total	5,118	5,264	5,656	5,741	5,794(R)	1,930	1,972	1,992	5,894	2,046(R)	2,053	2,014	6,113(p)	
VI. Outstanding Payments														
Advance Payments	66	79	90	83	92				80				110	
Progress Payments	4,402	4,346	4,750	5,451	5,981				6,765				7,179	
Total	4,468	4,425	4,840	5,544	6,073				6,845				7,289	
VII. Strength (Manpower)														
Military	2,969	3,094	3,229	3,334	3,371	3,371	3,368	3,377	3,377	3,382	3,393	3,412	3,412	3,416(p)
Civilian	1,088	1,138	1,184	1,230	1,268	1,273	1,274	1,303	1,303	1,311	1,306	1,274	1,274	1,277(p)

NA—Not available R—Revised

p—Preliminary

NOTE: Open spaces for Indicators other than No. VI indicate information not available at time of publication.

Indicator No. VI information available only on a quarterly basis.

 Directorate for Statistical Services
 OASD (Comptroller)
 28 November 1967



MEETINGS AND SYMPOSIA

JANUARY

Seminar on Strain Gage Techniques, Jan. 8-12, University of Miami, Coral Gables, Fla. Co-sponsors: University of Miami and the Society for Experimental Stress Analysis. Contact: Dir., Professional Education, Div. of Continuing Education, P. O. Box 8005, University of Miami, Coral Gables, Fla. 33124.

Fifth Conference on Symmetry Principles at High Energy, Jan. 24-26, University of Miami, Coral Gables, Fla. Sponsor: Air Force Office of Aerospace Research. Contact: Capt. D. R. Lehman, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5581.

Conference on Methodologies of Pattern Recognition, Jan. 24-26, University of Hawaii, Honolulu, Hawaii. Sponsor: Air Force Office of Aerospace Research. Contact: Mrs. R. W. Swanson, Air Force Office of Scientific Research (SRI), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5407.

International Conference on System Sciences, Jan. 29-31, University of Hawaii, Honolulu, Hawaii. Sponsor: Air Force Office of Aerospace Research. Contact: Maj. Paul J. Daily, Air Force Office of Scientific Research (SRMA), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 5-5261.

APRIL

Second National Conference on Space Maintenance and Extra-Vehicular Activities, April (date undetermined), Las Vegas, Nev. Co-sponsors: Air Force Aero Propulsion Laboratory, LTV, Inc., and National Aeronautics and Space Administration. Contact: Mr. Clodfelter, Air Force Aero Propulsion Laboratory (APFT), Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55875.

International Conference on Light Scattering Spectra in Solids, April (date undetermined), U. S. Army

Research Office-Durham, Durham, N. C. Sponsor: U. S. Army Research Office-Durham. Contact: Dr. Charles Boghosian, Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285, Ext. 34.

Symposium on the Structure of Low Medium Mass Nuclei, April (date undetermined), University of Kansas, Lawrence, Kan. Co-sponsors: Air Force Aerospace Research Laboratories, University of Kansas and North Carolina State University. Contact: Dr. G. I. Harris, Aerospace Research Laboratories (ARP), Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3618.

Photochemistry and Radiation Chemistry Symposium, April (date and location undetermined). Co-sponsors: U. S. Army Natick Laboratories and National Academy of Sciences-National Research Council Advisory Board. Contact: Dr. E. Hayon, Head, Physical Chemistry Laboratory, U. S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000, Ext. 137.

Symposium on the Topics of Fluids and Plasmas, April 16-18, Waldorf-Astoria Hotel, New York, N. Y. Sponsor: Air Force Office of Aerospace Research. Contact: Lt. Col. Robert B. Kalisch, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5518.

Fifth Symposium on Remote Sensing of Environment, April 16-18, University of Michigan, Ann Arbor, Mich. Co-sponsors: Air Force Office of Aerospace Research, Office of Naval Research and the Department of Agriculture. Contact: C. E. Molineux, Air Force Cambridge Research Laboratories (CRJT), L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3620.

Annual Frequency Control Symposium, April 22-24, Shelburne Hotel, Atlantic City, N. J. Sponsor: Electronic Components Laboratory, U. S. Army Electronics Command. Contact: M. F. Timm, Electronics Com-

ponents Laboratory (AMSEL-KL-ST), U. S. Army Electronics Command, Fort Monmouth, N.J. 07703, Phone (201) 535-2826 or 535-1728.

MAY

Second International Conference on Vacuum Ultraviolet Radiation Physics—Interaction with Solids, May 1-3, Gatlinburg, Tenn. Co-sponsors: U. S. Army Research Office-Durham and Office of Naval Research. Contact: Dr. Robert Mace, Dir., Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285.

Fifth National Colloquium on Information Retrieval, May 3-4, University of Pennsylvania, Philadelphia, Pa. Co-sponsors: Moore School of Electrical Engineering, University of Pennsylvania; Institute of Electrical and Electronic Engineering; Special Interest Group on Information Retrieval, American Documentation Institute; Association for Computing Machinery; and Frankford Arsenal. Contact: George Schechter, Chief, Objectives Analysis Office, Frankford Arsenal, Philadelphia, Pa. 19137, Phone (215) JE 5-2900 Ext. 3219.

Fourth International Conference on Universal Aspects of Atmospheric Electricity, May 12-18, Tokyo, Japan. Co-sponsors: Air Force Cambridge Research Laboratories, Office of Naval Research and the National Science Foundation. Contact: Capt. J. H. Shock, Air Force Cambridge Research Laboratories (CRTE), L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3636.

Second International Meeting on Silicon Carbide, May 14-16, Pennsylvania State University, University Park, Pa. Co-sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and Carborundum Co. Contact: C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 2234.

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Research Reports

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Springfield, Va. 22151

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Crystal Growth Studies of the Alkali Metals, the Rare Earths, and Cobalt. Virginia Institute for Scientific Research for the Air Force, Aug. 1967, 103 p. Order No. AD 657 053.

Mechanism of Fatigue of Copper at Interfaces. Columbia University for the Air Force, May 1967, 144 p. Order No. AD 656 427.

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Investigation of the Variables Controlling the Flux Growth of High Quality Laser Crystals. American Science and Engineering, Cambridge, Mass., for the Air Force, March 1967, 140 p. Order No. AD 655 388.

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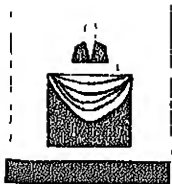
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FROM THE SPEAKERS ROSTRUM

Address by Lt. Gen. Jack J. Catton, USAF, Dep. Chief of Staff, Programs and Resources, Hq., USAF, to Old Crows Convention (an association of electronic warfare-oriented individuals) Washington, D.C., Sept 27, 1967.

Electronic Warfare in the Air Force

... After World War II, there was almost a total lack of interest and activity in electronic warfare (EW). Consequently, most of the Old Crows flew away! The impact of that mass migration on our military capability was little short of disastrous. The trans- and post-Korean efforts to reconstitute an EW capability in the Air Force—as well as in the other Services—were both painful and expensive. Had circumstances in Korea been otherwise, our lack of EW might have proven fatal. I think it important that we do not permit the Crows to fly away again.

I visualize two factors which may serve to prevent this reservoir of irreplaceable talent and experience from dissipating again. First, there is a growing awareness of the extent to which successful application of aerospace power is absolutely dependent upon a comprehensive and viable EW program. Certainly the pendulum of interest has swung from ignorance and apathy to what might be called an acute sense of awareness. The second factor, which I hope will preserve EW talent, is the association of Old Crows itself. Indeed, it may be that your group will become the predominant factor when the current conflict in Southeast Asia draws to its conclusion. It was the lack of a sense of immediacy which permitted our EW skills to dissipate in the first instance. We all know this sense of urgency will diminish as the impetus or armed conflict diminishes; as the military interest—expressed in

grants and contracts—declines; as the spotlight swings to other manifestations of public need. When that time comes—as inevitably it will—this association may well be called upon to serve as the rallying point to preserve the scientific and technological base upon which to build when the need again arises.

A strong information and technical base is absolutely essential to a segment of electronics as dynamic as EW. Such a base did not exist when we began our frantic reconstruction for the Korean conflict. Those were trying days. At one time the Air Force could identify less than 25 officers with the required background in EW. Those few people and some warehouses of surplus equipment were about all we had to work with. But time was on our side fortunately—time, and an opponent either unwilling or unable to employ EW to any marked degree.

Later we were able to reconstitute the basic EW capability in the Strategic Air Command (SAC), but it took a lot of time, effort and a great deal of money. Much of it was a do-it-yourself effort, utilizing World War II equipment. It was a monumental effort, but a successful one. That was the era when our national policy was based principally on massive retaliation. Consequently, the funds available for EW within the Air Force were, by and large, reserved for the bombers of SAC. There were a few folks in the fighter aircraft business who stood reproachfully on the sidelines and complained of this imbalance, but they were few in number and their protests were largely unheeded. Additionally, the EW needs of the Tactical Air Command (TAC) were unclear and the command was not too sure of its specific needs.

Thus it came as no particular shock to some of us, when Southeast Asia operations exposed a deficient EW capability in our tactical aircraft. Mr. John Q. Citizen regards the conflict in South Vietnam as a primitive struggle, characterized by rice paddies, bamboo stakes, tunnels, sampans,

etc. He has been told about the air war in North Vietnam. He knows about the heavy anti-aircraft fire around Hanoi, and he has certainly read a great deal about the surface-to-air missiles (SAMs) we have encountered. He has been told that our aircraft loss ratios have been decreasing steadily, and he may be vaguely aware that the SAMs are not nearly so effective as the Russians and North Vietnamese might hope. But I doubt that he fully appreciates the reasons for the low effectiveness of those missiles.

Importance of Electronic Warfare in Vietnam

It turns out that not everybody is crawling around the jungle in black pajamas. We are engaged in a contest with an intelligent enemy who possesses extremely sophisticated and complicated electronic equipment, and who knows how to exploit it to the maximum. Security has permitted us to reveal that the low loss rate to SAMs results from more than just skillful flying.

It has been acknowledged that our EW has also been more than a little successful against radar directed anti-aircraft fire. Again security does not permit us to discuss even more dramatic evidence of the nature of this EW battle. But it goes on daily, and it is no secret to you that EW is being employed more extensively today in Southeast Asia than in any previous conflict. It is also no secret to most of you that the tactical aircraft, which are conducting these daily electronic duels, were not properly equipped for this electronic battle when the conflict began.

Tactical fighter-bomber aircraft initially had literally no EW capability. Crash projects were begun or under conditions closely matching the situation we encountered during Korea. We enc

Electronic Warfare in the Cost-Effectiveness Equation

No one suggests that quantification of the effects of EW on a resourceful and capable opponent will be an easy task. Some very knowledgeable people have stated that it may, in fact, be impossible. Nonetheless, it is becoming increasingly difficult to compete for funds in the Pentagon unless a proposal is based on something more substantive than intuition, hope, or faith. In this regard, I would like to see some type of standard system of factors which could be used to quantify EW results in such a manner that the effectiveness of a given EW system could be compared to that of another. This would be of immense help to our budgeteers and programmers who often make these kinds of decisions in the defense of EW programs, without possessing a thorough technical background. . . .

EW capability is now a major factor in the design of a new weapon system and has a pronounced effect, not only on the cost and the performance of a weapon system but on the total numbers to be bought.

The design considerations for future aircraft are no longer restricted to such factors as range, altitude and speed. A major concern now is penetrability—the ability to get to the target at all. Penetrability, in this era of the sophisticated defense missile and command/control systems, becomes largely a matter of EW.

If EW is to receive appropriate consideration in this time of tightening budgets, with so many competitors for the dollar, our proposals must withstand the rigid scrutiny of cost effectiveness. It follows that we must find a more suitable measure of performance, one that permits wide application and ease of understanding. . . .

This search for a better handle on cost effectiveness of EW is not just a peculiarity of current Office of the Secretary of Defense management, as has been suggested in the press from time to time. We in the Air Force,

kinds of problems. Not the least of these was the initial reaction of the pilots when we proposed hanging anything onto the aircraft which could not be consumed in the engine or dropped on the enemy. This is no longer a problem. Further, we discovered that the designers of fighter aircraft had failed to seriously consider EW. There is not one type of tactical aircraft, operating in Southeast Asia today, which was designed originally with sufficient attention to the requirements of EW. In fact, the F-111, soon to be operational, is the first tactical aircraft to incorporate provisions for EW in its basic design.

My point is that we found ourselves unprepared for EW operations at the outset of the conflict. As with World War II and again in Korea, we have experienced the hasty improvisation of hardware, expensive aircraft modifications in terms of both dollars and degraded performance, short-fuze development and production contracts, etc. However, the situation was not entirely identical to that of Korea. For one thing, in the intervening years, we have invested heavily in EW research and development efforts, although much of these were directed toward bomber aircraft.

Problems of the R&D Effort

However, this substantial investment in research and development has not proved as beneficial as one might reasonably expect. There are at least two underlying problems which tend to limit the effectiveness of the research and development effort. I want to discuss them briefly, because it is important that you understand the difficulties which confront us. I think the solutions are as likely to come from the field and industry as they are to develop within the Pentagon. The first problem is the difficulty of converting promising developmental efforts into large-scale production. We share this deficiency with a large portion of the electronics industry. General Latta—another good friend of the Crows—discussed one aspect of this production problem in

a recent speech to the Armed Forces Communications-Electronics Association (AFCEA). He suggested that too large a segment of the electronics industry was preoccupied with solving the problems of tomorrow, rather than the problems of today. The theme of the AFCEA convention was "the best is yet to come." While this is indeed a noble theme, some needs are so urgent today that we may be unable to wait for the promise of a better tomorrow. The search for the "best" may well preclude attainment of the "better."

We need, I think, to concentrate on doing today what can be done today. We need, first and foremost, to obtain a basic EW capability in every tactical aircraft which might conceivably be employed in Southeast Asia or in any other crisis management role this country may be forced to confront in the future. Industry can make a major contribution here through renewed emphasis on the production rather than on development.

Let me hasten to add that the difficulty of transition from development to production cannot be laid entirely at the doorstep of industry. This brings me to the second of the two problems. I wish to spend a few moments on this problem because the solution, if there is one to be found, may come from industry, the universities, or the institutes.

Our problem concerns the difficulty in determining, documenting and presenting the effectiveness of EW in the cost-effectiveness equation. We need your assistance here, and we need it badly. The difficulty lies on the effectiveness side of the cost-effectiveness equation.



Lt. Gen. Jack J. Catton, USAF

and I'm confident I speak for the other Services as well, grow increasingly concerned over the potential impact of EW on the design, the size, the cost, and the employment of future weapon systems. We absolutely must obtain some relevant measure of effectiveness if responsible decisions and judgments are to be made. We ask you to help us solve this problem—one which may well be the most significant EW problem today. . . .

In closing I am reminded of the phrase that Sir Winston Churchill used in probably the first public commendation of EW. "The war of wizards," he called it. Here was a man who understood the larger aspects of EW and its ultimate importance. I suspect he might indorse the continuing efforts to make the Old Crows a viable and truly professional society.

It is a sort of Churchillian wisdom that can be applied to EW problems of the past, present and future; for this was a man who could draw meaningfully from the traditions of history as a basis for progress. I think the rich and colorful history of the Crows can also serve you in a meaningful way as you assume your role in the future.

Address by Maj. Gen. Walter E. Lotz Jr., Asst. Chief of Staff for Communications-Electronics, Department of the Army, at the Annual Meeting of the Assn. of the U.S. Army, Washington, D.C., Oct. 10, 1967.

New Trends in Communications

Over a year ago a senior Army general, upon return from a visit to Vietnam, stated that the item of equipment, which has provided the greatest improvement in ground combat, was the radio set, AN/PRC-25. This radio set, with its vehicular counterpart, the AN/VRC-12, and its aircraft version, is providing reliable and effective voice communications at all echelons within the division, and over the extended ranges required by tactical units in the Vietnam environment.

These equipments, although new to the users, have a long history in the materiel side of the house. Their development started over a decade ago. They were mass produced in the early 1960s and were initially issued to units in 1963. Today all U.S. units in Vietnam and Europe have them. Within a few years they will have been issued to all Army regular and reserve force units.

To this family of tactical FM voice radios has been added another member, the lightweight infantry set. It improves significantly radio command and control from the platoon to squad. It, too, has a long history. The Army completed testing of this set a few years ago. Two were shipped to Vietnam for test in 1966. The reaction was most favorable. Last summer the first production models were sent there, and since then the demand for this set has been overwhelming.

An ingenious variation of the tactical FM family has been used to great advantage in Vietnam—the airborne command and control console. It consists of three standard vehicular radios mounted behind the pilot's seat in a helicopter. With this console a commander can maintain contact with his own and superior headquarters, and with any of his subordinate units. From his vantage point in the helicopter, he can reconnoiter the battlefield and control all the elements of the battle, including maneuver, coordination of firepower, and commitment of reserves and support. The airborne command and control console was first devised by the 11th Air Assault Division in the test of the air mobile concept in 1963. It proved so valuable a tool of command and control in the hands of the 1st Cavalry Division that all divisions in Vietnam now have it.

Because commanders have effective and reliable voice radio, they do not normally resort to written orders as in previous combat experience. In Vietnam, divisions issue written field orders as infrequently as every 10 days. Operations are initiated and controlled by voice radio. Thus the full mobility of Army forces can be exploited, and rapid and flexible responsiveness is achieved.

You can now detect a significant trend in tactical communications—the use of voice radio as opposed to written messages as the primary means of command and control within the division. This is possible because

the Army has in inventory effective tactical voice radio equipment that is reliable, flexible and secure, when necessary.

There are significant clues to the future to be found in today's adaptation of portable and vehicular FM radio sets to airborne command and control. The next generation of tactical voice radios should consist of one basic set of modules which can be assembled in various combinations to meet all manpack, vehicular and aircraft needs, including integral voice security.

The Army communicator cannot be self-satisfied just because of success in the tactical FM field. We have communications problems in other areas that cannot be merely glossed over. Let me cite one—the use of manual tactical telephone switchboards. Although in Vietnam we are getting the job done with the boards we have, there is a pressing need to do better. Manual, cord-type switchboards are of World War II vintage. They are inherently slow and inefficient in interconnecting voice circuits, and they are costly in manpower. Automatic electronic switches overcome these disadvantages. In addition, automatic switches make possible many service features not available on cord-type boards. Some of these are the elimination of operator interrupt and erroneous disconnection. These manual switching inadequacies cannot be tolerated by commanders and staffs in the fast-moving combat environment of today. It is a drag on the entire communication system. With the help of industry we must, at an early date, make available an interim system which will improve, serve and provide an orderly transition to the digital transmission and computer switches planned in the future.

The Integrated Wideband Communications System

Another new trend is derived from communications in Vietnam. It is contained in the Integrated Wideband Communications System (IWCS). The IWCS is a system of multichannel

radio and submarine cables which provides long distance trunks between centers of military interest throughout Southeast Asia.

The IWCS represents an investment of several hundreds of millions of dollars. It is being engineered, installed, operated and maintained primarily by the U.S. Army Strategic Communications Command. It represents a truly magnificent effort by Army strategic communicators in responding to urgent operational needs. The magnitude and complexity of this system were aptly described by a senior official of the American Telephone and Telegraph Co. He stated that the Army had undertaken to provide in Southeast Asia in a few years what the Bell System had undertaken to provide on a much larger scale in the United States for the past 80 years.

The IWCS, with its extensions, interconnects bases, headquarters, airfields and depots. Its circuits provide high speed data, long distance telephone dialing, radio programs, and message service within Southeast Asia, and interconnects with other Pacific bases and the Continental United States. It is a strategic communications system serving all the Military Services and other agencies. It is fixed in nature and designed to Defense Communications System characteristics and specifications.

On the other hand, the IWCS provides tactical interconnections between widely dispersed low level combat, combat service, and combat support units. In this sense, it is a tactical communications system replacing a major portion of the Army area communications system. Ordinarily, tactical communications doctrine provides for interconnections between Army tactical communications and the theater strategic communications at the rear of the field army. The IWCS has over 75 such interconnections well forward of the senior Army headquarters.

Many serious engineering, equipment and personnel problems are encountered when numerous tactical interconnections are provided to strategic communications. Tactical circuits must be capable of rapid rearrangement, reconnection and re-engineering to be responsive to the changing tactical needs. Strategic communications equipments and procedures were not designed with this

flexibility. In addition, there are incompatibilities in the technical standards of strategic communications equipment and tactical communications equipment. The result is that complex interface equipment is required at the interconnect sites. This adds to the cost and complexity of the system, complicates the training of operation and maintenance personnel, and reduces the time response of the system in a highly transient combat environment.

Experience with the IWCS and with similar wideband networks in Europe and elsewhere shows conclusively that we cannot differentiate, operationally and technically, between strategic and tactical communications. There must be only one set of engineering standards, a single system design philosophy, common operating procedures, common personnel and training, and compatible organization structures for all Army communications networks. We must design an integrated communications system with interconnectable networks from the highest level in the command hierarchy to the lowest.

Joint Commonality and Compatibility

The IWCS points up another significant trend. This is the need for compatibility—even commonality—of joint, combined and other agency communications in the combat zone. I need not elaborate on the nature of joint operations in Vietnam. In the past the Army, to a large extent, designed its tactical Army area system primarily to support ground forces. The Air Force has designed its Integrated Tactical Air Control System to serve TACAIR. We no longer can ignore that, when committed in combat, these systems are superimposed upon one another.

In-theater, broadband systems provide circuits to fight, move and support Army divisions, Air Force groups, Navy task forces, Marine divisions and allied units. They provide communications for logistic, construction, medical, administrative and other support elements. They may serve the needs of other U.S. Government agen-

cies and the national needs of the host country.

It is clear that we cannot, within the combat area, build independent communications systems, costing hundreds of millions of dollars, for each Service and function engineered to peculiar needs of each, operated by standard procedures of each. We must have common procedures, compatible technical characteristics and, to the extent possible, interchangeable equipment.

There is nothing new about interconnecting Service systems or using common or joint communications. The new trend discernible is the far greater degree of integration of the former separate communications systems, facilities and personnel of the Military Services into a single system.

The Secretary of Defense just a few months ago directed the establishment of a joint commonality and compatibility program for tactical command, control and communications that is tying together the efforts of the Military Services. Project Mallard, the Army's future tactical area system, which is being undertaken in cooperation with British, Canadian and Australian armies, has recently received active participation by the Air Force, the Navy and the Marine Corps. The joint commonality and compatibility program and Project Mallard are but two of many joint actions and programs that are reshaping the nature of tactical communications in a manner similar to that of the Defense Communications Agency in the strategic area.

I think it essential for all of us to be keenly aware of the implications of this trend. Standardization, compatibility and even single Service communications support are necessary and inevitable. However, response of communications to the needs of the commanders at all levels must be assured.

Finally, the most significant trend in Army communications concerns communicators themselves. It arises as a result of a series of actions directed by the Chief of Staff of the Army after a review of branch structure and officer careers.

The first of the actions I wish to highlight occurred in June 1966 when the Chief of Staff approved the functions of signal officers which were derived from the following rationale: "The Signal Corps is an arm and as

such signal officers must be qualified to serve as an integral member of the combined arms team. They must be qualified and proficient in all aspects of combat planning and operations in order to participate effectively and render the necessary communications and electronics capabilities required for command and control, fire, maneuver, intelligence and logistical support."

The second action at the same time was a Chief of Staff decision to designate all Army communications officer positions as Signal Corps assignments. These positions are those staff communications positions in the battalion headquarters of infantry, artillery, armor and other branch units.

The Function of the Army Communicator

Since its founding in the days of the Civil War, the Signal Corps has had the mission of providing communications. However, as the modern era of electronics dawned, this branch accumulated many other missions of importance. These diluted the Signal Corps' efforts in its tactical communications role. Now we see a redirection of orientation of signal officers to their bread and butter mission—communications support of combat.

The Korean War was the last occasion when professional communicators, Signal Corps officers, filled communications positions in the basic combat arms units. However, after the war this practice was discontinued. In 1963, with the reorganization of the ROAD Division, the brigade communications officer position was designated a Signal Corps slot. Now the assignment of Signal Corps officers to serve as battalion communications officers place junior signal officers as integral members of the combat team. After all, if a Signal Corps officer is to be primarily oriented toward combat communications, he must be given the opportunity of learning and proving himself to be both a professional soldier and a communicator.

The above actions, when viewed together, clearly outline a pattern—

communications personnel have become a part of the combat team. This is evident in all parts of the Army. Several years ago the Army consolidated training of communications officers at Fort Sill. Starting in January 1967, the input to this course has been entirely signal officers who have completed the basic course at the Signal Corps School or who have had equivalent training. The course has been reoriented more heavily toward tactics of basic combat units. The communications officer receives as much training on the combined arms team as does the artillery officer. Highest priority on the assignment of the graduates of this course is to basic combat units in Vietnam.

As members of the combat team in Vietnam, signal units and personnel have an inescapable obligation to get their job done on their own. Many key communications sites must be on isolated mountain tops—many of these in Viet Cong controlled areas. Signal personnel organize and defend their sites and conduct reconnaissance patrols. They are proving themselves as soldiers as well as communicators.

In summary, the new trends in Army communications are:

- More widespread use of voice radio in command and control of combat units.
- The breakdown of established distinctions between strategic and tactical communications.
- The need for universal compatibility of military communications systems.
- A pressing need for combat qualified officers who can technically cope with modern sophisticated communications systems.



Maj. Gen. Walter E. Lotz Jr., USA

Army Aviation Materiel Command Advisory Group Formed

A seven-man Aviation Scientific Advisory Group, consisting of leaders in the fields of aeronautical research, development and education, has been formed to advise Major General John Norton, commander of the Army Aviation Materiel Command (AVCOM), St. Louis, Mo., on scientific and technological matters.

Chairman of the group is Professor Rene H. Miller, Slater Professor of Flight Transportation at the Massachusetts Institute of Technology's Department of Aeronautics and Astronautics.

Members include:

Dr. Kurt H. Hohenemser, Professor of Aerospace Engineering, Washington University, St. Louis, Mo.

Dean Leon Z. Seltzer, Parks College of Aeronautical Technology, St. Louis University.

Dr. William Bollay, visiting Professor of Aeronautics and Astronautics, Stanford University, Palo Alto, Calif.

Dr. Robert G. Loewy, Associate Professor of Mechanical and Aerospace Sciences, University of Rochester, N.Y., and director of the university's Space Science Center.

Fred W. Wolcott, Vice President of Research Analysis Corp., McLean, Va.

Charles H. Zimmerman, Hampton, Va., former Director of Aeronautical Research for the National Aeronautics and Space Administration, and Chief Engineer with the Army Materiel Command before his retirement last July.

The group will be on call to advise General Norton on matters concerning various aspects of AVCOM's operations.

AVCOM, as the commodity command for the Army's global aviation program, conducts research and development, engineering, purchasing, and provides supply and maintenance support for more than 8,000 Army aircraft, mainly helicopters. The command's funding last year amounted to more than \$1.5 billion.

Resource Management Depends on Reliable Reports

Charles W. Kullman

The implementation of Cost Information Reports as a reporting requirement in defense contracts has caused increased interest and more involvement of contractor personnel in these reports. In addition to those who have followed the development of the program through the Cost and Economic Information System (CEIS) and Selected Acquisition Information and Management System (SAIMS), more contracting personnel, DOD and defense contractor, are seeking to know the status of the CIR program, the extent of its implementation, and its relationship to the structure of Resource Management Systems.

The Cost Information Reports were formerly a part of the larger Cost and Economic Information System concept. CEIS has been separated into Cost Information Reports (CIR) and Economic Information Systems (EIS). Within DOD, CIR is assigned to the Office of the Assistant Secretary of Defense (Comptroller), while EIS is assigned to the Office of the Assistant Secretary of Defense (Systems Analysis).

The Place of CIR in Resource Management Systems

Resource Management Systems, in broadest terms, means all the systems that aid DOD management in its task of assuring that resources are obtained and used, both effectively and efficiently, in the accomplishment of DOD objectives.¹ The word "re-

source" in this context means labor, materials and services, measured in dollar terms. Resource Management Systems include all procedures for collecting and processing recurring quantitative information that relates to resources and that is generated for the use of management.² This definition excludes all non-resources, e.g., intelligence, tactical doctrine, military justice; and all non-systems, e.g., one-time collection of data, submission of test reports, and exchange of correspondence.

Resource Management Systems include the following as shown in Figure 1:

- Systems for programming and budgeting.

² DOD Directive 7000.1, Aug. 22, 1966.



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- Systems for management of resources for operating activities.
- Systems for management of inventory and similar assets.
- Systems for management of acquisition, use and disposition of capital assets.

The Acquisition Information and Management System relates to the management of capital assets and is composed of the Selected Acquisitions Information and Management Systems (SAIMS) and Other Capital Acquisitions. While CIR and EIS formerly comprised the forerunner concept of CEIS, the SAIMS program is a broader concept which, in addition, includes the Contract Funds Status Report, plus Performance Management (see Figure 1).

DOD policy³ regarding the Acquisition Information and Management System is to:

- Focus on the item (or component thereof) being acquired, its quality, its time schedule, and its cost (in terms of both plans and actuals).
- Include special information subsystems applicable to acquisitions of related major capital items.
- Standardize and control to the extent practicable, so as to minimize the data gathering and reporting workload imposed on contractors and in-house activities.
- Structure so as to minimize changes required to accounting systems used by contractors.

The EIS, CIR and the Contract Funds Status Report components of SAIMS have received Bureau of the Budget approval of their reporting formats. Economic information reports, consisting of the DOD and NASA Plantwide Economic Report (Format 1) and DOD and NASA In

³ Ibid.

¹ Robert N. Anthony, Assistant Secretary of Defense (Comptroller), "Resource Management Systems," address at the DOD Advanced Planning Briefings for Industry, Boston, Mass., March 3, 1966, Defense Industry Bulletin, April 1966, pp. 18-21.

dividual Project Economic Report (Format 2), collect economic impact data from specific contractors semi-annually. The external information is used in conjunction with the Five Year Defense Program (FYDP), and other data developed within the Government will be used to forecast employment by plant and communities.

The Contract Funds Status Report (CFSR), DD Form 1586, was approved by the Bureau of the Budget in December 1966. It will provide the DOD components with information to assist in updating and forecasting contract fund requirements, in planning and decision making on funding changes, and in developing fund requirements and budget estimates in support of approved programs. It will

also provide input data to those DOD managers concerned with the need for and flow of funds. These managers will analyze the CFSR with other inputs for the purpose of forecasting funding needs at the DOD/contractor interface, as well as within DOD channels.⁴

The report is normally to be submitted on a calendar quarter-year basis. Coverage would normally be limited to line items funded in the amount of \$500,000 or more. Provision has been made in DOD Instruction 7800.7 for reduced levels of detail for small contracts between \$100,000 and \$500,000, for time and materiel

⁴ DOD Instruction 7800.7, Dec. 23, 1966, p. 2.

contracts, and for similar effort where the entire CFSR report might not be required. This reduced level of reporting may be extended to contracts larger than \$500,000 if the DOD component does not desire the full report. Excluded from coverage by this report are firm fixed-price contracts. In addition, all contracts, whose total value is less than \$100,000, and all contracts, expected to be completed in six months or less, will also be excluded from CFSR coverage.

Definitive instructions are still to be issued on the performance management segment of SAIMS, and further instructions will be issued by DOD on other capital acquisitions—other than included under SAIMS.

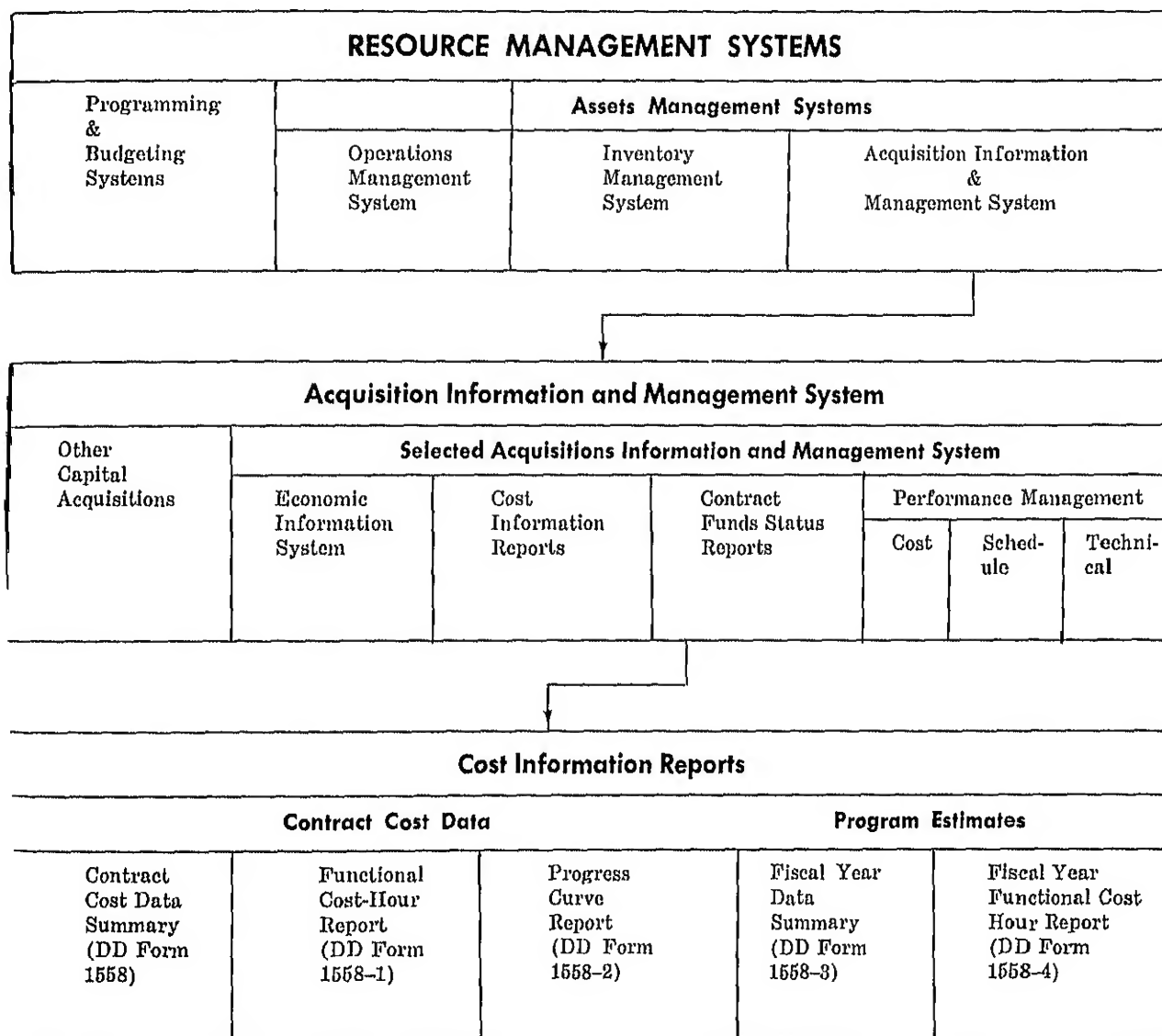


Figure 1.

CIR Reports

The CIR reports consist of those used for gathering contract cost data and those used for program estimates, as shown in Figure 1. Detailed instructions for preparing the forms are contained in a DOD booklet titled, "Cost Information Reports (CIR) for Aircraft, Missile, and Space Systems," dated April 21, 1966, Budget Bureau No. 22-R260, and will not be covered in this article. The requirement to submit the forms will be a "term" of the contract and be included in the data requirements. The forms will be executed by the contractor, with "contractor" defined to include prime contractor, associate contractor, subcontractor, and in-house DOD equivalents. However, use by the Military Services for reporting by in-house equivalents is optional within each Service, and does not require approval of the Office of the Secretary of Defense which is described later in this article. The purpose of the forms is to assist both industry and Government in estimating and analyzing the costs of weapon or support system development and production. The reporting requirements are not designed to support a detailed system or project management capability.

The data to be collected are important to DOD in carrying out its cost estimating, programming, budgeting and procurement responsibilities. Thus the reports will provide background information useful in performing feasibility and pre-design studies, making choices among competing development of production alternatives, and negotiating systems development and production contracts. The CIR reports will not supplant the current requirements for submission of pre-contractual data where required by the Armed Services Procurement Regulation (ASPR). The long-standing National Inventory Control Point contract price analysis function and the activities of the Defense Contract Audit Agency will not be reduced, with respect to pre-contract or contract modification functions, by the implementation of the CIR forms.

The CIR implementation will extend from the final approval for engineering development through completion of production. The reporting requirements are designed to provide the following:

- Actual costs to date and estimated and actual costs at completion of contracts.
- Estimated costs by fiscal year for support of the Five Year Defense Program and special studies.
- Information in support of DD Form 633, "Department of Defense Contract Pricing Proposal," for new weapon or support system programs, or for the continuation or major modification of current weapon or support system programs. The CIR will not be used to provide information in support of proposals for competitive firm fixed-price procurements as outlined in ASPR 3-807.3.

Control of CIR

CIR reporting is restricted to aircraft, missile and space systems and their related components which are estimated to require cumulative Research, Development, Test and Evaluation (RDT&E) Total Obligational Authority of \$25 million, or cumulative production Total Obligational Authority in excess of \$100 million. The CIR concept may be extended in the future to include ships, electronic systems, armor, ordnance, or other large systems. The frequency of submission of CIR reports is specified by DOD as shown in Figure 2.

Contractors using the CIR forms will report actual costs to date, plus estimated costs to contract comple-

tion. Reporting requirements are established within a framework that provides for cost reporting in a similar functional manner among contractors for items of hardware, software, or services for major classes of items covered by CIR reporting requirements (aircraft, missile, space systems). This framework is the Work Breakdown Structure (WBS) and the items of hardware, software, or services listed functionally by indented levels are its elements. The WBS elements recommended for CIR coverage are submitted in a CIR Data Plan to the CIR Data Plan Review Committee, in the Office of the Assistant Secretary of Defense (Comptroller). Only the approved requirements for CIR data will be incorporated by the contracting officers in Requests for Proposal, and reflected in resulting contracts.

Deviations from contractual CIR reporting requirements will require contract amendment. Reporting contractors must insure that the proper security classification, within the meaning of the Espionage Act, is assigned to each report. Classification terms, such as Confidential or Secret, may not be used to describe the proprietary nature of data. Company information of a proprietary nature obtained in the reports, will be protected by DOD.

(Continued on Page 31)

MINIMUM REPORTING FREQUENCY REQUIRED BY DOD				
CIR REPORT DD Form Numbers	RDT&E FUNDING		PROCUREMENT FUNDING	
	Semi-annual	Annual	Semi-annual	Annual
1558	X			X
1558-1	X			X
1558-2	X		X	
1558-3		X		X
1558-4		X		X

It should be noted that all CIR forms except the Progress Curve Report (DD Form 1558-2) may be requested semiannually. The Progress Curve Report may be requested quarterly. The foregoing are maximum reporting frequencies.

Figure 2.

Pollution Threatens Electromagnetic Compatibility

J. Paul Georgi

National defense, with its dependence upon electronics for effective employment of weapons and forces, is faced with a pollution as serious as that threatening our air or water.

This pollution is caused by crowding of the electromagnetic spectrum as more and more equipment is added to the military arsenal.

The Defense Department was the author and champion of the "systems" and "systems analysis" concepts. It is time that this concept be applied in the electromagnetic compatibility area. In this era of nuclear trigger decisions, the philosophy of building black boxes and systems, and then applying fixes to get them to perform their intended functions is passé and hazardous.

To permit the systems approach, analytical tools are being developed at the Department of Defense Electromagnetic Compatibility Analysis Center (ECAC), located across the Severn River from the U.S. Naval Academy in Annapolis, Md.

Established early in 1961 as part of the DOD June 1960 Electromagnetic Compatibility Program, ECAC is currently operating under DOD Directive 5160.57, dated Sept. 23, 1966. ECAC is a joint DOD center, functioning under the direction of the Secretary of the Air Force. Administratively, the center operates as a detachment of the Electronic Systems Division of the Air Force Systems Command.

The mission of ECAC, as defined within the directive, is to provide advice and assistance on electromagnetic compatibility matters to the Secretary of Defense, the Joint Chiefs of Staff, the Military Departments and other DOD components.

Specific responsibilities assigned to ECAC include:

- Establishment and maintenance of data bases necessary for analysis of DOD electromagnetic compatibility problems.

- Development of mathematical models and computer analysis techniques for investigation of inter-Service compatibility problems.

- Rapid access to the ECAC data bases and analysis techniques by other DOD components, and assistance to other DOD components who are developing their own analysis techniques for intra-Service compatibility analysis.

- Analysis of communications and electronic equipment in being, under development, or proposed for development to determine its electromagnetic compatibility with other equipments in present and projected environments, and provision of appropriate recommendations.

- Analysis of frequency allocation and assignment planning to provide appropriate recommendations thereon in support of the Joint Frequency Panel of the Military Communications-Electronics Board.

Since the nature of electromagnetic compatibility is such that potential incompatibility has to be considered at various levels, the clear delineation of ECAC's responsibility for inter-Service level electromagnetic compatibility analysis and the Services' responsibilities for intra-Service compatibility analysis should be noted.

To be responsive to the DOD assigned responsibilities, the ECAC has developed a number of unique facilities and capabilities.

There are approximately 300 people at ECAC, most of them specialists, i.e., mathematicians, electronic engineers, physicists, computer pro-

grammers and operators, and data processors, whose sole mission is electromagnetic compatibility. In addition, ECAC has a UNIVAC 1107 computer which is utilized completely for electromagnetic compatibility efforts.

It has, or is in the process of obtaining, a world-wide data base upon which to develop mathematical models and make predictions. The data base consists of:

- An environmental file which contains geographic location and operational information on all military and some civilian communications and electronics equipment.

- A technical characteristics file on the transmitters, receivers and antennas of concern.

- A digitized terrain information file with which propagation losses can be reflected in the system analysis.

In addition, mathematical models, which represent the performance of military operational equipments, have been developed for rapid analysis of interference problems. These mathematical models simulate functions of communications and electronic equipments, propagation phenomena, deployment situations, and other factors that contribute to electromagnetic compatibility problems.

ECAC's overall electromagnetic compatibility data processing and analysis systems have been designed to provide inputs to, or solutions for, 14 basic problem types:

- Listings.
- Site evaluation.
- Frequency assignment for specified geographical locations.
- Site selection (comparison).
- Signal density.
- Susceptibility density.
- Frequency allocation.
- Equipment specifications.
- Equipment comparison.

- Power density.
- Separation criteria.
- Equipment characteristics synthesis.
- Frequency assignment for sterile environments.
- Frequency assignment planning aids.

A problem coming into the center must be defined by the project engineer in terms that the computer can understand. The geographical bounds of the problem determine what environmental data must be extracted from the data base. For example: A receiver operating at a particular ground location should be examined with respect to all transmitters within approximately 200 miles of this location. The same receiver in an aircraft could suffer interference from transmitters within approximately 500 miles. If the same receiver were in a satellite, the potential interfering source might be located within a band around the earth. The problem definition then tells us what portion of the environmental data must be extracted from the data base.

To go through each transmitter receiver pair in the environment is a very tedious task. In general, there are many thousands of equipments in a geographic area. If one were to represent the equations representing the operations of these equipments in sufficient detail to make precise prediction of the interference levels at appropriate receivers of interest, the amount of time required would be excessive. In order to circumvent this problem, a process known as culling is introduced into the model.

This is a process of examining the environment by going through it systematically and rejecting those transmitter receiver combinations which cannot cause interference, refining the process, going through those equipments which are left, and, finally, making relatively precise predictions of interference levels and degradation on the remaining equipments.

There are a number of practical problems which must be considered in predicting interference levels. The first of these problems is the fact that the parameters of the problem are variable, including tuned frequency, modes of operation, antenna adjustments, and other equipment characteristics. Another practical problem arises because of unavailability

of data. Included might be terrain elevation data and environment characteristics. The results of these uncertainties is that the final answer will invariably be probabilistic in nature.

The analysis services of ECAC can be considered as a series of steps. At each of these steps, it is possible that an answer to a specific communications-electronics problem can be obtained, but some problems may require going through many steps, each successfully more difficult in analysis. The first step would be the production of an environmental summary listing; in some cases, this may solve certain problems. The second step could be a power density calculation, followed by a cull based on interference-to-noise ratios and a signal-to-noise ratio. In many cases, the results obtained by this process may be insufficient to indicate whether a significant problem is anticipated to determine what the primary cause may be. If this step is not sufficient, further work can be done to produce cull degradation values and again, if this is not sufficient, a more refined prediction of signal-to-interference ratio and degradation values can be made.

In view of the different levels of problem solutions required, i.e., rough cull, refined cull, prediction, etc.,



J. Paul Georgi has been the Technical Director of the DOD Electromagnetic Compatibility Center since June 1961. He has served with the Government since 1940 in several positions in the electronic engineering field. Mr. Georgi holds a Master's Degree in Business Administration (Weapon System Manager) from the Air Force Institute of Technology.

ECAC has developed operational automated prediction systems. These systems are systematically used in everyday problem solution. The varying depths of analysis are achieved by using various versions of the prediction system. A brief description of several versions of such a system is given below:

• Version 1.

All equipment spectral characteristics are synthesized from nominal data providing a conservative cull analysis that can be performed rapidly.

• Version 2.

The option is provided to the user in this version to input any desired receiver characteristics whether synthesized, measured, or hypothetical.

• Version 3.

The option is provided to input any desired set of emission characteristics for the transmitter.

• Version 4.

This version produces the power density at selected environmental locations. It is generally used for siting problems and hazards studies.

• Version X

This version provides a degradation analysis capability and is used only after the environment has been culled. Communications degradation, radar scope conditions, and desensitization effects are computed. It is also possible for the user to input any desired transmitter-to-receiver coupling factor in lieu of having the model calculate the propagation path loss and antenna gain. In addition to the basic capability, special analysis systems are sometimes required. ECAC has developed a one-to-one search radar prediction model, a frequency-distance separation model for establishing operational tradeoffs, and numerous other statistical and environmental analysis capabilities. This storehouse of analytical tools provides the flexibility necessary for preventative problem solution, i.e., the potential problem can be studied and corrected before it actually occurs. A problem, by the way, as far as ECAC is concerned, is any analysis effort. Many of our problems are not field problems, but are investigations to determine whether a problem will exist in the field if specific equipment is built or used in a certain manner.

The compatibility analysis experience of ECAC can be applied to a wide variety of inter-Service investi-

gations. The availability of an extensive data base at the center, as well as the development of expertise and specialized analysis techniques, enable ECAC to provide a unique service in this regard. Many U.S. military and government agencies and military-sponsored contractors have already taken advantage of this service.

The following list is typical of the types of evaluations that have been conducted by ECAC:

- Development of a list of potential interference sources and victim receivers.
- Guidance in the selection of locations for satellite communication system ground-station terminals.
- Evaluations and implications of various advanced system design parameters on operational performance in the system's intended environment.
- Development and support of test planning efforts intended to evaluate the effects of electromagnetic compatibility on acquisition and tracking system performance.
- Guidelines for making frequency assignments to various communications and radar mobile/tactical systems and deployments.
- Determinations of power densities in the vicinity of high-power radar systems.
- Analysis of guidance system and missile receiver performance for various tactical missions.
- Evaluation of factors governing operations of collocated high, very high, and ultra-high frequency communications equipments.
- Technical support to frequency management, primarily with regard to the potential effects of incorporating new electronic systems into present environments.
- Determination of expected in-band and out-of-band performance characteristics of planned transmitters and receivers.

The Defense Department has had since June 1960, a comprehensive program to cope with radio interference between electronic equipments and systems. This program recognized that in the final analysis electromagnetic compatibility of electronic equipments and systems would be achieved only through judicial spectrum management, electromagnetic compatibility

conscious design, and controlled operational use of communications and electronic equipment and systems. As an integral part of the DOD Electromagnetic Compatibility Program, ECAC has developed data bases, analytical models, computer routines, and interference predictions systems with which to provide support in each of these areas.

Through the proper channels, ECAC services are available to defense contractors. These services are listed in a document titled, "Data and Analytical Services Available from the Electromagnetic Compatibility Analysis Center (ECAC)." This document can be obtained by contacting the Electromagnetic Compatibility Analysis Center, North Severn, Annapolis, Md. 21402.

The Cost Information Reports

(Continued from Page 28)

Progress of Implementation of CIR

As Resource Management Systems continue to develop into a more firm concept, additional guidance has been issued. CIR, as a part of this concept, has benefited from the issuance of directives and instructions including the following:

- DOD Directive 7045.1, Feb. 13, 1964, "DOD Programming System."
- DOD Directive 7041.1, July 7, 1964, "Cost and Economic Information System."
- DOD Instruction 7045.2, Jan. 29, 1965, "DOD Programming System; Procedures for Program Changes."
- DOD Instruction 7041.2, June 13, 1966, "Cost Information Reports."
- DOD Directive 7001.2, Aug. 22, 1966, "Resource Management Systems of the Department of Defense."
- DOD Instruction 7800.7, Dec. 23, 1966, "Contract Funds Status Report."

In addition, an ASPR subcommittee is working on a proposed draft of ASPR coverage of CIR, to be followed by inclusion in the ASPR of provisions relating to the Contract Funds Status Report.

As of April 1, 1967, the Assistant Secretary of Defense (Comptroller) received a total of 25 Cost Data Plans for approval of CIR reporting re-

quirements. Sixteen were approved before that date, with the remaining nine being reviewed, or being amended for resubmission. It is contemplated that approximately 11 more Cost Data Plans will be submitted in the near future. This gives some idea of the progress of implementation of CIR into the aircraft missile and space systems.

Recent Developments

DOD is currently planning instructional workshops in CIR for government employees and for contractor personnel on a regional basis. The ASPR subcommittee is exploring the possibilities of obtaining CIR coverage in letter contracts rather than waiting until a definitive contract is written later.

The purpose of CIR, to collect cost and related data on major items of military equipment to assist both industry and Government in estimating and analyzing the cost of weapon system development, is continually coming closer to realization.

Data Systems Center Established by Air Force

An Air Force Data Systems Design Center (AFDSDC) has been established at Bolling AFB, Washington, D.C.

The center will operate as an individual agency, placing under one command the Air Force Headquarters agencies previously engaged in the design of standard automated data systems. The new agency will report directly to the Office of the Air Force Chief of Staff.

AFDSDC mission is threefold: to analyze, design, develop, test, implement and maintain all automated data processing systems assigned to it; to incorporate approved integration and interface requirements in assigned systems and to recommend additional integration and interface; and to develop and maintain non-functional software and standards covering programming, programming languages, and documentation for standard automated data systems.

Colonel Vernon R. Turner, previously assigned to Air Force Headquarters, will command the new center.

Fiscal Year 1967

Top 100 Defense Contractors Announced

Top 100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1967 (July 1, 1966-June 30, 1967)

The 100 companies which, together with their subsidiaries, received the largest dollar volume of military prime contracts of \$10,000 or more in FY 1967 accounted for 65.5 percent of the U. S. total. This rate was 1.7 percentage points above the 63.8 percent received by the top 100 companies in FY 1966. The increase in the 100-company percentage was due to a sharp upswing in aircraft procurement which rose from \$7.5 billion in FY 1966 to \$9.7 billion in FY 1967.

Military prime contract awards of \$10,000 or more to all U. S. companies for work in the United States and overseas totaled \$39,219.4 million, or \$5,686.8 million more than in FY 1966. Because of this sizeable increase, it required \$46 million in awards for a company to be listed in FY 1967 compared with \$40 million in FY 1966. The largest amount going to a company in FY 1967 was \$2,124.6 million, whereas the largest in FY 1966 was \$1,531.0 million.

Rank	Company	Millions of Dollars
U. S. Total*		\$39,219.4
Total: 100 companies and their subsidiaries*		
1.	McDonnell Douglas Corp.	2,111.6
	Conductron Corp.	5.3
	Ilycon Mfg. Co.	5.0
	Tridea Electronics Co.	2.7
	Total	2,124.6
2.	General Dynamics Corp.	1,818.7
	Stromberg-Carlson Corp.	12.8
	United Electric Coal Co.	0.4
	Total	1,831.9
3.	Lockheed Aircraft Corp.	1,799.8
	Lockheed Shipbuilding & Construction Co.	7.4
	Total	1,807.2
4.	General Electric Co.	1,289.8

5.	United Aircraft Corp.	1,097.1
6.	Boeing Co.	911.7
7.	North American Aviation, Inc.	688.8
8.	American Telephone & Telegraph Co.	158.9
	Bell Telephone Co. of Pa.	"
	Chesapeake & Potomac Tel. Companies	11.9
	Mountain States Tel. & Tel. Co.	1.7
	New England Tel. & Tel. Co.	0.6
	New Jersey Bell Tel. Co.	0.5
	New York Tel. Co.	0.1
	Northwestern Bell Tel. Co.	0.2
	Ohio Bell Tel. Co.	0.9
	Pacific Northwest Bell Tel. Co.	0.2
	Pacific Tel. & Tel. Co.	0.6
	Southern Bell Tel. & Tel. Co.	2.6
	Southwestern Bell Tel. Co.	1.0
	Western Electric Co.	493.8
	Total	673.1
9.	General Motors Corp.	625.0
	Frigidaire Sales Corp.	0.1
	Total	625.1
10.	Ling-Temco-Vought, Inc.	91.0
	Continental Electronics Mfg. Co.	4.4
	Continental Electronics Systems, Inc.	"
	Kentron Hawaii, Ltd.	12.0
	LTV Aerospace Corp.	310.7
	LTV ElectroSystems, Inc.	103.4
	LTV Ling Altec, Inc.	0.9
	Okonite Co. (The)	3.4
	Wilson & Co.	8.9
	Total	534.7
11.	Textron, Inc.	16.6
	Accessory Products Corp.	0.1
	Bell Aerospace Corp.	478.2
	Bostitch, Inc.	"
	Dalmo Victor Co.	"
	Durham Mfg. Co.	"
	Malco Electronics	"
	Speidel Corp.	0.1
	Textron Electronics, Inc.	1.2
	Textron Industries, Inc.	"
	Townsend Co.	0.2
	Total	496.6
12.	Grumman Aircraft Engineering Corp.	487.7
13.	Sperry Rand Corp.	484.1
14.	Raymond International Inc.; Morrison-Knudsen Co., Inc.; Brown & Root, Inc.; & J. A. Jones Construction Co.	462.5
15.	Westinghouse Electric Corp.	442.6
	Deco Electronics, Inc.	3.7
	Thermo King Corp.	6.8
	Total	453.1
16.	AVCO Corp.	448.6
17.	Hughes Aircraft Co.	419.5
18.	Ford Motor Co.	87.4
	Philco-Ford Corp.	316.4
	Total	403.8
19.	Raytheon Co.	384.1
	Amana Refrigeration, Inc.	"
	D. C. Heath & Co.	"
	Edex Corp.	"
	Machlett Laboratories, Inc.	18.5
	Micro State Electronics Corp.	0.2
	Raytheon Learning Systems Co.	"
	Seismograph Service Corp.	0.3
	Total	403.3
20.	Honeywell, Inc.	313.7
21.	Northrop Corp.	208.5
	Hallcrafters Co.	17.9
	Northrop Carolina, Inc.	10.9
	Page Communications Engineers, Inc.	69.1
	Total	306.4
22.	Kaiser Industries Corp.	5.5
	Kaiser Aerospace & Electronics Corp.	3.5
	Kaiser Jeep Corp.	145.8
	Kaiser Steel Corp.	18.1
	National Steel & Shipbuilding Co. ^d	132.8
	Total	305.7
23.	Bendix Corp.	289.3
	Bendix Field Engineering Corp.	4.7
	Bendix-Westinghouse Automotive Air Brake Co.	0.7
	Dage Electric Co., Inc.	"
	Fram Corp.	0.7
	Microwave Devices, Inc.	0.1
	Mosaic Fabrications, Inc.	0.5

P&D Mfg. Co., Inc.	0.1	31. Uniroyal, Inc.	217.3	Chevron Oil Co.	1.9
Sheffield Corp.	c	Uniroyal International Corp.	c	Chevron Shipping Co.	0.6
Total	296.1	Total	217.3	Community Oil Co., Inc.	0.3
24. Martin Marietta Corp.	274.9	32. Collins Radio Co.	201.6	Pacific Oil Co.	0.1
Bunker-Ramo Corp.	15.3	33. Hercules, Inc.	193.5	Standard Oil Co. (Ky.)	12.0
Total	290.2	Haveg Industries, Inc.	1.7	Standard Oil Co. of Texas	2.2
25. Ryan Aeronautical Co.	118.9	Total	195.2	Total	152.8
Continental Aviation & Engineering Corp.	26.0	34. International Business Machines Corp.	194.6	44. Day & Zimmerman, Inc.	142.2
Continental Motors Corp.	136.5	Service Bureau Corp.	0.2	45. General Telephone & Electronics Corp.	0.0
Wisconsin Motor Corp.	8.7	Science Research Associates	0.1	Automatic Electric Co.	5.9
Total	290.1	Total	194.9	Automatic Electric Sales Corp.	1.0
26. General Tire & Rubber Co.	17.3	35. Newport News Shipbuilding and Dry Dock Co.	188.5	General Telephone Co. of the Southwest	0.1
Aerojet Delft Corp.	0.9	36. Litton Industries, Inc.	17.7	General Telephone Directory Co.	0.1
Aerojet General Corp.	224.5	Aero Service Corp.	c	General Telephone & Electronics Laboratories, Inc.	0.1
Batesville Mfg. Co.	25.1	Airtron, Inc.	c	Lenkurt Electric Co., Inc.	11.1
Fleetwood Corp.	0.1	Clifton Precision Products Co., Inc.	c	Sylvania Electric Products, Inc.	120.2
Frontier Airlines, Inc.	c	Ingalls Shipbuilding Corp.	12.0	Total	138.5
General Tire International Co.	0.7	Kester Solder Co.	c	46. Morrison-Knudsen Co.	2.5
Space General Corp.	4.4	Kimball Systems, Inc.	c	Ferguson H. K. Co.	0.4
Total	273.1	Litton Precision Products, Inc.	7.5	National Steel & Shipbuilding Co. ^d	132.8
27. Radio Corp. of America	268.0	Litton Systems, Inc.	142.7	Total	135.7
National Broadcasting Co., Inc.	c	Monroe Calculating Machine Co.	c	47. Norris Industries, Inc.	127.3
RCA Institutes, Inc.	c	Monroe International, Inc.	0.2	Fyr-Fyter Co.	0.3
RCA Defense Electronics Corp.	0.4	Profexray, Inc.	c	Total	127.6
Total	268.4	Total	180.3	48. General Precision Equipment Corp.	0.0
28. International Telephone & Telegraph Corp.	149.7	37. du Pont (E. I.) de Nemours & Co.	23.3	American Meter Controls	c
Barton Instrument Corp.	0.1	Remington Arms, Inc.	156.3	Controls Co. of America	0.6
Documat, Inc.	0.1	Total	179.6	General Precision, Inc.	112.8
Federal Electric Corp.	66.3	38. Thiokol Chemical Corp.	172.7	General Precision Decca Systems, Inc.	0.5
ITT Gilfillan, Inc.	36.1	39. F M C Corp.	161.2	Graflex, Inc.	1.2
ITT Technical Services, Inc.	0.8	Ferguson (Harry J.) Co.	0.2	Strong Electric Corp.	1.6
ITT Terryphone Corp.	1.1	Gunderson Bros. Engineering Corp.	8.3	Tele-Signal Corp.	4.7
Jennings Radio Mfg. Corp.	0.6	Total	169.7	Vapor Corp.	2.8
Puerto Rico Telephone Co.	0.4	40. Chrysler Corp.	164.3	Total	124.2
Total	255.2	Chrysler International SA	0.4	49. Texaco Inc.	24.2
29. Ogden Corp.	0.0	Chrysler Outboard Corp.	c	Caltex Oil Products Co. ^e	48.3
Avondale Shipyards, Inc.	227.6	Total	164.7	Jefferson Chemical Co.	0.6
Eimeco Corp.	0.2	41. Goodyear Tire & Rubber Co.	60.3	Texaco Caribbean, Inc.	c
International Terminal Operating Co., Inc.	3.5	Goodyear Aerospace Corp.	89.3	Texaco Experiment, Inc.	0.8
Ogden Technology Laboratories, Inc.	0.1	Goodyear International Corp.	0.2	Texaco Export, Inc.	45.5
SMS Instruments, Inc.	1.4	Kelly-Springfield Tire Co.	0.1	Texaco Puerto Rico, Inc.	3.7
Tillie Lewis Foods, Inc.	3.3	Motor Wheel Corp.	4.6	Texaco Trinidad, Inc.	c
Wilson Foods, Inc.	0.7	Total	154.5	White Fuel Co., Inc.	1.1
Total	236.7	42. Olin Mathieson Chemical Corp.	154.3	Total	124.2
30. Standard Oil Co. (New Jersey)	0.0	43. Standard Oil Co. (California)	86.4	50. Sanders Associates, Inc.	124.0
American Cyrogenics, Inc.	0.8	Caltex Oil Products Co. ^e	48.3	51. T R W, Inc.	120.5
Esso International, Inc.	144.3	Chevron Asphalt Co.	0.1	52. Asiatic Petroleum Corp.	117.2
Esso Research & Engineering Co.	0.7	Chevron Chemical Co.	0.9	53. Signal Oil & Gas Co.	7.7
Esso Standard Eastern, Inc.	0.1			Garrett Corp.	104.0
Humble Oil & Refining Co.	89.2			Petroleum Heat & Power Co.	0.1
Total	235.1			Southland Oil Corp.	2.4
				Space Petroleum Corp.	1.7
				Total	116.8

54. Harvey Aluminum, Inc.	116.5
55. Pan American World Airways, Inc.	115.1
56. Mobil Oil Corp.	109.3
57. Eastman Kodak Co.	108.4
Eastman Kodak Stores, Inc.	0.3
Total	108.7
58. Mason & Hanger-Silas Mason Co.	108.4
59. Pacific Architects & Engineers, Inc.	106.9
60. Lear Siegler, Inc.	87.8
American Avitron, Inc.	0.1
Astek Instrument Corp.	0.5
Hokanson (C.G.) Co., Inc.	0.1
L S I Service Corp.	11.6
T. I. C. Engineers, Inc.	0.1
Transport Dynamics, Inc.	0.6
Total	100.8
61. Magnavox Co.	98.6
62. Massachusetts Institute of Technology	94.9
63. American Machine & Foundry Co.	93.2
AMF Beaird, Inc.	e
AMF Tuboscope, Inc.	0.1
Cuno Engineering Corp.	0.5
Voit (W. J.) Rubber Corp.	0.3
Total	94.1
64. Texas Instruments, Inc.	93.4
Metal & Controls, Inc.	0.3
Total	93.7
65. Fairchild Hiller Corp.	93.4
Burns Aero Seat Co.	0.1
Total	93.5
66. Curtiss-Wright Corp.	90.8
67. Teledyne, Inc.	87.8
68. Dillingham Overseas Corp. & H. B. Zachry Co.	87.8
69. Chamberlain Corp.	•
70. Flying Tiger Line, Inc.	73.4
71. International Harvester Co.	72.7
72. Federal Cartridge Corp.	72.4
73. Johns Hopkins University	71.1
74. Aerospace Corp.	70.8
75. Dow Chemical Co.	66.5
Dow Corning Corp.	1.5
Total	67.0
76. Continental Airlines, Inc.	65.7
77. White Motor Corp.	48.1
Hercules Engines, Inc.	15.6
Minneapolis-Moline, Inc.	0.9
Oliver Corp.	0.1
Total	64.7
78. CONDEC Corp.	61.9
Consolidated Controls Corp.	1.1
Total	63.0

79. Western Union Telegraph Co.	62.4
80. Emerson Electric Co.	56.9
Pace, Inc.	0.5
Rantec Corp.	0.1
Supreme Products Corp.	4.7
Total	62.2
81. Firestone Tire & Rubber Co.	61.0
Dayton Tire & Rubber Co.	0.3
Total	61.3
82. Bethlehem Steel Corp.	54.3
Bethlehem Steel Export Corp.	3.7
Calmar Steamship Corp.	2.3
Total	60.3
83. Airlift International, Inc.	59.0
84. Hughes Tool Co.	58.6
85. Cessna Aircraft Co.	52.1
Aircraft Radio Corp.	4.6
Total	56.7
86. Atlantic Research Corp.	56.3
Northeastern Engineering, Inc.	.2
Total	56.5
87. Sverdrup & Parcel, Inc.	0.9
A R O, Inc.	55.6
Total	56.5
88. American Mfg. Co. of Texas	54.9
89. Stevens (J. P.) & Co., Inc.	53.4
90. Vinnell Corp.	53.1
91. Westinghouse Air Brake Co.	14.1
Failing (George E.) Co.	0.3
Le Tournieu-Westinghouse Co.	2.7
Melpar, Inc.	15.4
Wilco Electric Co., Inc.	19.4
Total	61.9
92. System Development Corp.	50.4
93. Northwest Airlines, Inc.	50.3
94. Gulf Oil Corp.	49.8
Industrial Asphalt, Inc.	0.1
Total	49.9
95. Smith Investment Co.	0.0
Smith, A. O. Corp.	48.5
Total	48.5
96. Motorola, Inc.	42.7
Motorola Communications & Electronics, Inc.	5.0
Motorola Overseas Corp.	0.1
Total	47.8
97. Cities Service Co.	0.0
Cities Service Gas Co.	0.5
Cities Service Oil Co.	39.4

Cities Service Tankers Corp.	7.6
Total	47.5
98. Tumpane Co., Inc.	46.9
99. Union Carbide Corp.	44.5
Englander Co., Inc.	1.0
Konrad Corp.	0.7
Ocean Systems, Inc.	0.6
Total	46.8
100. Maxson Electronics Corp.	45.9
Hopkins Engineering Co.	0.1
Total	46.0

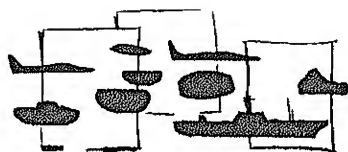
* Net value of new procurement actions minus cancellations, terminations and other credit transactions. The data include debit and credit procurement actions of \$10,000 or more under military supply, service and construction contracts for work in the United States, plus awards to listed companies and other U. S. companies for work overseas. Procurement actions include definitive contracts, the obligated portions of letter contracts, purchase orders, job orders, task orders, delivery orders, and any other orders against existing contracts. The data do not include that part of indefinite quantity contracts that have not been translated into specific orders on business firms, nor do they include purchase commitments or pending cancellations that have not yet become mutually binding agreements between the Government and the company.

^b The assignment of subsidiaries to parent companies is based on stock ownership of 50 percent or more by the parent company, as indicated by data published in standard industrial reference sources. The company totals do not include contracts made by other U. S. Government agencies and financed with DOD funds, or contracts awarded in foreign nations through their respective governments. The company names and corporate structures are those in effect as of June 30, 1966. Only those subsidiaries are shown for which procurement actions have been reported.

^c Less than \$50,000.

^d Stock ownership is equally divided between Kaiser Industries Corp. and Morrison-Knudsen Co.; half of the total military awards is shown under each of the parent companies.

^e Stock ownership is equally divided between Standard Oil Co. of California and Texaco, Inc.; half of the total of military awards is shown under each of the parent companies.



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of November 1967:

DEFENSE SUPPLY AGENCY

- 2—Boatz Mfg. Co., Evansville, Ind. \$1,727,056. 6,300 gasoline field range outfits and 2,800 gasoline field range cabinets, with one complete set of tooling for each cabinet and miscellaneous cabinet parts. Defense General Supply Center, Richmond, Va. DSA 400-68-C-2230-TP 512.
- Otis Elevator Co., Cleveland, Ohio. \$1,202,826. 226 fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400-68-C-2262.
- Michael, Inc., Philadelphia, Pa. \$1,821,000. 60,000 men's polyester and wool tropical coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0890.
- Bannercrest Clothing. \$1,232,000. 40,000 men's polyester and wool tropical coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0891.
- 7—Raymer Bag Corp., New Bedford, Mass. \$1,461,645. 7,400,000 polypropylene sand bags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-1658-001.
- Sun Garden Packing Co., Preston, Md. \$1,764,615. 336,875 cases of canned tomatoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 180-8-C-116B2.
- Tri-Valley Growers, San Francisco, Calif. \$1,038,054. 228,992 cases of canned tomatoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 180-8-C-116B3.
- 8—American Oil Co., Chicago, Ill. \$1,226,714. 6,240,000 gallons of gasoline, 688,000 gallons of diesel, and 1,506,000 gallons of fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0444.
- 9—Morris Bros., New York, N.Y. \$2,717,072. 1,711,344 white cotton bed sheets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0841.
- 15—Peri Pillow Co., Houston, Tex. \$4,730,202. 209,572 mountain sleeping bags. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0568.
- 22—Bonham Mfg. Co., Bonham, Tex. \$1,448,098. 205,200 men's nylon, cotton seateen field coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0908.
- Rolane Sportswear, Ridgely, Tenn. \$1,000,500. 150,000 men's nylon, cotton seateen field coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-0907.
- 24—Addison Shoe Corp., Wynne, Ark. \$1,944,614. 250,365 pairs of mildew-resistant safety shoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1026.
- General Cable Corp., New York, N.Y. \$2,270,002. 48,730 reels of telephone cable. Defense Industrial Supply Center, Philadelphia, Pa. DSA 600-68-C-1043.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract Number.



DEPARTMENT OF THE ARMY

- 1—AVCO Corp., Stratford, Conn. \$11,311,300. Turbine engines for the CH-47 Chinook helicopter. Aviation Material Command, St. Louis, Mo. DA-AJ01-67-C0292.
- Iowa Mfg. Co., Cedar Rapids, Iowa. \$1,447,560. Diesel engine driven crushing and screening plants. Mobility Equipment Command, St. Louis, Mo. DA-AK01-67-CA002.
- 2—Martin Marietta, Orlando, Fla. \$52,000,000. FY 1968 Pershing ground support equipment. Army Missile Command, Huntsville, Ala. DA-AH01-68-C0532.
- Boeing Co., Morton, Pa. \$11,000,000. FY 1969 pre-buy of sets of long lead time items for CH-47G helicopters. Aviation Material Command, St. Louis, Mo. DA-AJ01-69-C0001.
- 3—ACF Industries, St. Louis, Mo. \$2,507,400. Metal parts for cluster bomb units. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0191.
- Scovill Mfg. Co., Waterbury, Conn. \$2,456,622. Metal parts for cluster bomb units. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0190.
- Batesville Mfg. Co., Batesville, Ark. \$2,435,517. Metal parts for cluster bomb units. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0189.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$3,706,023. 105mm projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-67-C0297.
- 6—Vatronics, Inc., West Paterson, N.J. \$1,291,400. Fuzes for aircraft flares. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0195.
- Hupp Corp., Canton, Ohio. \$5,148,480. Ten and 20 horsepower, gasoline-operated engines. Mobility Equipment Command, St. Louis, Mo. DA-23-195-AMC-00284.
- 8—Brunswick Corp., Lincoln, Neb. \$1,223,097. Grommets for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. AA-09-68-C0160.
- Aerojet General, Downey, Calif. \$2,579,200. Metal parts for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. AA00-68-C0142.
- General Motors, Ypsilanti, Mich. \$11,200,428. 20mm guns and gun bodies for use on single wing aircraft. Army Weapons Command, Rock Island, Ill. DA OA41-68-C0014.
- Thompson Submarine Development Corp., Springfield, Mass. \$1,000,000. Submarine development. Navy, Washington, D.C.
- 9—Etowah Mfg. Co., Gadsden, Ala. \$3,149,525. Metal parts for artillery round boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0206.
- Delaware Valley Armaments, Inc., Mount Laurel, N.J. \$4,252,200. Metal parts for artillery round boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0204.
- Emco Porcelain Enamel Co., Port Chester, N.Y. \$1,940,000. Small arms ammunition boxes. Frankford Arsenal, Philadelphia, Pa. DA-AA25-67-C-723.
- Lehigh, Inc., Easton, Pa. \$2,616,804. Parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0206.
- Honeywell, Inc., Hopkins, Minn. \$2,222,025. Metal parts for nose fuzes for 750-lb. bombs. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0205.
- tion Procurement & Supply Agency, Joliet, Ill.
- United Aircraft, East Hartford, Conn. \$6,630,000. Engines for CH-54A aircraft. Aviation Material Command, St. Louis, Mo. DA-AJ01-67-C0876.
- Sperry Rand Corp., St. Paul, Minn. \$1,500,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- 13—Remington Arms Co., Bridgeport, Conn. \$32,856,583. Manufacture of miscellaneous small arms ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-19-010-AMC-00003 (A).
- Sperry Rand, New York, N.Y. \$41,241,006. Manufacture, load, assembly and packing of ammunition. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-178-AMC-00080.
- Olin Mathieson Chemical Corp., East Alton, Ill. \$3,416,922. Propellants and related raw materials. Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-178-AMC-00100.
- Standard Products Co., Cleveland, Ohio. \$3,571,285. Truck assemblies for M114 vehicles. Port Clinton, Ohio. Tank Automotive Command, Warren, Mich. DA-AE07-68-C0093.
- Norris Industries, Los Angeles, Calif. \$1,119,084. Maintenance and repair of facilities in support of 60/80mm projectile metal parts and 105mm cartridge cases. Riverside, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-178-AMC-00098.
- 15—Brad's Machining Products, East Gadsden, Ala. \$4,365,000. Metal parts for artillery fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0209.
- Ingraham Co., Bristol, Conn. \$1,980,633. Metals part for artillery fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0213.
- General Time Corp., Skokie, Ill. \$1,509,500. Bomb fuzes. Frankford Arsenal, Philadelphia, Pa. DA-AA25-67-C0690.
- 16—Raytheon Co., Bedford, Mass. \$8,200,500. Advanced development of SAM-D missiles. Army Missile Command, Huntsville, Ala. DA-AH01-67-C1005.
- Booz-Allen Applied Research, Chicago, Ill. \$1,765,721. Scientific and technical effort to support continuing studies, evaluation and analyses of military doctrine for the Army Combat Development Command Institute of combined arms and support at Fort Leavenworth, Kan. Northwest Procurement Agency, Oakland, Calif. DA-AG05-67-C0437.
- 17—AVCO Corp., Stratford, Conn. \$25,984,582. UH-1 and OV-1 aircraft engines. Aviation Material Command, St. Louis, Mo. DA-AJ01-68-C0954.
- Beech Aircraft, Wichita, Kan. \$2,070,050. Bomb dispensers. Salina, Kan. Procurement Detachment, Chicago, Ill. DA-AA00-68-C0009.
- McDonnell Co., St. Louis, Mo. \$1,275,000. Development of a trainer set for the medium anti-tank assault weapon system. Titusville, Fla. Army Missile Command, Huntsville, Ala. DA-AH01-67-C0104.
- Model Screw Products, Inc., Hazelwood, Mo. \$1,212,750. 4.2-inch cartridge containers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0921.
- 20—American Fabricated Products, Inc., Indianapolis, Ind. \$1,001,278. Cartridge containers for obturating assemblies for 4.2-inch cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0922.
- Harvey Aluminum Sales, Torrance, Calif. \$34,784,577. Loading, assembling and packing of ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-178-AMC-00520.
- 21—Chamberlain Mfg. Co., Waterloo, Iowa. \$1,922,215. Metal parts for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-67-C0363.

- Sylvania Electric Products, Mountain View, Calif. \$4,692,728. Classified work Santa Cruz, Calif. Mobility Equipment Command, Research and Development Center, Fort Belvoir, Va. DA-AK02-68-C0216.
- 24—Amron Corp., Waukesha, Wis. \$2,588,970. Cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-C0233.
- 27—General Time Corp., Stamford, Conn. \$2,415,000. Metal parts for M125A1 detonator boosters. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0064.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$2,000,000. Modernization activities at the Army Ammunition Plant, Seranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-36-031-AMC-00163.
- Eastern Tool & Mfg. Co., Belleville, N.J. \$1,636,193. Metal parts for 60mm rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C0226.
- J.H.W., Inc., Dover, Del. \$2,277,432. Construction of an elementary school. Okinawa Engineer Dist., Okinawa DA-CA70-68-C0034.
- Watkins Johnson Co., Palo Alto, Calif. \$1,678,208. Microwave system receivers for technical support of defense programs White Sands, N.M. White Sands Missile Range, N.M. DA-AD07-68-C0010.
- Hughes Aircraft, Culver City, Calif. \$1,476,590. Feasibility demonstration project for the Tow/Chaparral missile system. Army Missile Command, Huntsville, Ala. DA-A1101-67-C2487.
- Brunswick Corp., Sugar Grove, Va. \$1,181,860. 30mm cartridge launchers. Army Arsenal, Edgewood, Md. DA-18-036-AMC-00902.
- 28—Atlas Chemical Corp., Wilmington, Del. \$14,081,083. Production of TNT and maintenance activities at the Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-531.
- General Time Corp., Stamford, Conn. \$10,653,602. Fuzes, Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0223.
- Farmers Chemical Assn., Tynes, Tenn. \$1,349,402. Support services for the manufacture of explosives. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00300.
- Ryan Stevedoring Co., Mobile, Ala. \$5,163,000. Stevedoring services at Brooklyn AFB, Ala. for period of Jan. 1, 1968 through Dec. 31, 1969. Headquarters, Eastern Area, Military Traffic Management and Terminal Service, Brooklyn, N.Y. DA-IIC21-68-D0044.
- Equitable-Higgins Shipyards, New Orleans, La. \$1,070,081. Repair and alteration of a barge. Engineer Dist., Memphis, Tenn.
- Honeywell, Inc., Tampa, Fla. \$1,801,735. Various multiplexers and spare parts. Electronics Command, Philadelphia, Pa. DA-A105-68-C0013.
- 29—L.D. Precision Components Corp., Jamaica, N.Y. \$2,860,250. Metal parts for boosters. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C0237.
- Honeywell, Inc., Framingham, Mass. \$1,500,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- 30—Eastman Kodak, Kingsport, Tenn. \$54,412,050. Explosives. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-W-11-173-AMC-35(n).
- Uniroyal, Inc., New York, N.Y. \$12,480,340. Various explosive and operations and maintenance activities at the Army Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00062.
- General Instrument Corp., Chicopee, Mass. \$4,491,382. Metal parts for 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C-0246.
- General Electric Co., Burlington, Vt. \$6,020,654. Armament pods, 7.62mm automatic guns and ancillary equipment. Army Weapons Command, Rock Island, Ill. DA-AF03-68-C-0010.
- Raytheon Co., Lexington, Mass. \$2,090,527. Advance production engineering for the improved Hawk missile system. Andover and Bedford, Mass. Army Missile Command, Huntsville, Ala. DA-A1101-67-C0A019.

- Martin Marietta, Orlando, Fla. \$2,389,258. Consultants for the aerial mine system. Procurement Detachment, Chicago, Ill. DA-AA09-68-C0028.
- American Machine & Foundry Co., York, Pa. \$2,267,352. Metal parts for 4.2-inch mortar projectiles. Procurement Detachment, Chicago, Ill. DA-AA09-67-C0336.
- Norris Industries, Los Angeles, Calif. \$2,193,274. 81mm projectiles. Vernon, Calif. Northwest Procurement Agency, Oakland, Calif. DA-A607-68-C-0415.
- SCM Corp., Deerfield, Ill. \$1,830,585. Teletypewriter teleprinter-transmitters. Electronics Command, Philadelphia, Pa. DA-A105-68-C0608.
- Uniroyal, Mishawaka, Ind. \$1,190,400. Collapsible 10,000-gallon-tank assemblies for petroleum. Wasaw, Ind. Mobility Equipment Command, St. Louis, Mo. DA-AK01-67-C-0302.
- Canadian Commercial Corp., Ottawa, Ontario, Canada. \$1,003,072. Telescopes and components. DA-AA26-68-C0311. \$1,021,871. 30 caliber ball cartridge propellant. Frankford Arsenal, Philadelphia, Pa. DA-AA26-68-C0310.



DEPARTMENT OF THE NAVY

- 1—Kaiser Aluminum & Chemical Sales, Hialehorpe, Md. \$4,005,296. AM-2 aluminum landing mats for use on airfields. Naval Air Engineering Center, Philadelphia, Pa. NOO-156-68-C-0439.
- 2—Teledyne Systems Co., Hawthorne, Calif. \$7,715,200. Self-contained navigation systems. Naval Air Systems Command, NOO 19-67-C-189.
- Alisco, Inc., St. Louis, Mo. \$2,653,227. Rocket launchers. Naval Air Systems Command NOO(019-67-C-0621.
- Sunstrand Corp., Rockford, Ill. \$2,479,326. Constant speed drives and frequency control boxes for the F-4 aircraft program. NOO(019-68-C-0083. Constant drives and related equipment for A-7 aircraft. Naval Air Systems Command NOO(019-68-C-0088.
- Mine Safety Appliances Co., Pittsburgh, Pa. \$1,769,000. Oxygen-breathing apparatus and oxygen canisters for shipboard firefighting and damage control. Evans City, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa. NOO-104-68-C-1412.
- Lundy Electronics & Systems, Glenhead, N.Y. \$1,500,030. Countermeasure chaff. Pompano Beach, Fla. Navy Ships Parts Control Center, Mechanicsburg, Pa. NOO-104-68-C-0439.
- 3—North American Rockwell Corp., Columbus, Ohio \$39,756,982. RA-5C weapons systems. Naval Air Systems Command, NOO(019-68-C-0190.
- McDonnell Douglas Corp., St. Louis, Mo. \$33,300,000. Long lead time authorization for F-4E, RF-4C, and F-4D aircraft. Naval Air Systems Command, NOO 19-67-0171.
- Hartmann-Huyck Systems Co., Huntington Station, N.Y. \$1,715,000. Airborne navigational computer display systems. Naval Air Systems Command, NOO(019-67-C-0503.
- Magnavox Co., Fort Wayne, Ind. \$1,602,168. Airborne detection transmitting sets and associated equipment. Naval Air Systems Command, NOO 19-67-C-0678.
- Vocaline Co. of America, Old Saybrook, Conn. \$1,322,000. Sonobuoy, bathythermograph transmitter set and underwater sound signal testing. South Bristol, Maine. Naval Air Systems Command, NOO(019-68-C-0124.
- General Electric, Washington, D.C. \$1,005,200. Turbine generator sets with voltage regulators and exciters. Fitchburg, Mass. Naval Air Systems Command, NOO(024-68-C-6168.
- Scope, Inc., Reston, Va. \$2,600,000. Electronics systems equipment with associated repair parts and technical data. Naval Air Systems Command, NOO(024-68-C-1079.
- 6—Southeastern Electric Contracting Co., Virginia Beach, Va. \$1,423,600. Installation of utilities at the Naval Shipyard, Norfolk, Va. Naval Facilities Engineering Command Nby-67143.
- 7—Westinghouse Electric, Baltimore, Md. \$1,590,00. Design, development and manufacture of one X-Band Radar Impact Scoring System. Naval Ship Systems Command, NOO(024-68-C-1070.
- 8—Texas Instruments, Dallas, Tex. \$1,831,000. Equipment used with AN/APQ-116 radar system on A-7A aircraft. Navy Aviation Supply Office, Philadelphia, Pa.
- 9—Hughes Aircraft, Canoga Park, Calif. \$16,950,697. Walleye guided missiles for the Navy and Air Force. Naval Air Systems Command, NOO(019-68-C-0120.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,147,000. Increase in limitation of authorization for EA-6B aircraft. Naval Air Systems Command, NOO(019-67-C-0078.
- North American Aviation, Columbus, Ohio \$5,000,000. T-2B aircraft. Naval Air Systems Command, NO(A)-68-0081.
- Raytheon Co., Bedford, Mass. \$3,826,353. Rocket motors. Naval Air Systems Command, NOO(019-67-C-0019.
- M.I.T., Cambridge, Mass. \$1,290,000. Fabrication of control equipment spares and computer checkout software for support van for the Navy's Deep Submergence Rescue Vehicle.
- Norfolk Shipyard and Drydock Corp., Norfolk, Va. \$1,170,951. Overhaul of oiler USS Aucilla (AO-56). Supervisor of Shipbuilding, Fifth Naval Dist., Portsmouth, Va. N62678-68-R79.
- 13—Owens Corning Fiberglass Corp., Washington, D.C. \$1,165,000. Countermeasure chaff. Ashton, R.I. Navy Ships Parts Control Center, Mechanicsburg, Pa. NOO(019-68-C-0900.
- 14—Alabama Dry Dock & Shipbuilding Co., Mobile, Ala. \$41,063,900. Construction of two submarine rescue vessels and one exhibition model of the ship type. Naval Ship Systems Command, NOO(024-68-C-0250.
- Pennsylvania State University, University Park, Pa. \$7,697,000. MK-48 torpedoes. Naval Ordnance Systems Command, NO(A) 65-0234-MOD. #19.
- Bunker-Ramo Corp., Silver Spring, Md. \$5,620,225. EOM equipment. Naval Air Systems Command, NOO(019-68-C-0210.
- Curtiss-Wright Corp., Wood-Ridge, N.J. \$2,843,878. Spare parts for aircraft engines. Navy Aviation Supply Office, Philadelphia, Pa. F41608-67-A-5900-G189.
- Raytheon Co., South Lowell, Mass. \$2,164,913. Guidance and control groups for Chaparral missiles. Naval Air Systems Command, NOO(019-68-C-0102.
- 15—LTV Aerospace Corp., Dallas, Tex. \$4,000,000. Long lead time effort for A-7D aircraft. Naval Air Systems Command, NOO(019-67-C-0143.
- Martin Marietta Corp., Baltimore, Md. \$3,388,082. Classified work on Navy aircraft. Naval Air Systems Command NOO(019-67-C-0337.
- United Boatbuilders, Bellingham, Wash. \$2,250,000. Construction of 39 31-foot river patrol boats. Naval Ship Systems Command, NOO(024-68-C-0253.
- Texas Instruments, Dallas, Tex. \$2,112,376. Components and technical services for radio navigation sets. Naval Ship Systems Command, NOO(024-68-C-1068.
- 16—Beech Aircraft Corp., Wichita, Kan. \$4,678,347. AQM-37A missile targets. Naval Air Systems Command, NOO(019-67-C-0172.
- Sanders Associates, Nashua, N.H. \$1,746,500. Development work on an ECM system. Naval Air Systems Command NOO(019-68-C-0085.
- Westinghouse Electric, Baltimore, Md. \$1,000,000. Increase in the scope of the MK48 Mod O, torpedo test and evaluation program. Naval Ordnance Systems Command, NO(A) 64-0705-1 Mod. #40.
- Teledyne Systems Co., Hawthorne, Calif. \$1,175,000. IHAS components. Naval Air Systems Command, NOO(019-67-C-0189.
- 20—General Dynamics, Pomona, Calif. \$7,830,714. Standard Arm missiles with shipping containers. Naval Air Systems Command, NOO(019-67-C-0899.

- General Electric, Schenectady, N.Y. \$4,709,360. Nuclear propulsion research and development. Naval Ship Systems Command. N00024-67-C-5016.
- United Aircraft, Stratford, Conn. \$1,521,600. SH-3D helicopters. Naval Air Systems Command. N00019-67-C-0239.
- Clymer Machine Co., Trumbauersville, Pa. \$1,281,185. Holding rings and adapters for 5-inch, 38 caliber projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0897.
- 11—FMC Corp., Minneapolis, Minn. \$8,152,810. MK-22 guided missile launching systems and related equipment. Naval Ordnance Systems Command. 00017-67-C-2116.
- 22—Raytheon Co., Lexington, Mass. \$12,635,162. Sparrow III guided missiles and associated equipment. Lowell, Mass. Naval Air Systems Command. N00019-67-C-0029.
- Sperry Rand, St. Paul, Minn. \$3,956,067. Program tapes for the A-NEW program. Naval Air Systems Command. NOW 66-0813.
- Westinghouse Electric, Baltimore, Md. \$1,000,000. Production prototype models of special exercise sections for MK-48 torpedoes. Naval Ordnance Systems Command. NOW64-0705-I Mod #41.
- General Dynamics, Groton, Conn. \$3,000,000. Refueling, overhaul and subsequent testing of the nuclear ballistic missile submarine USS James Madison (SSBN-627). Naval Ship Systems Command. N00024-68-C-0256.
- 24—AYCO Corp., Cincinnati, Ohio. \$3,041,280. Countermeasure sets. Naval Electronics Systems Command. N00039-68-C-0510.
- 27—Raytheon Co., South Lowell, Mass. \$9,254,816. Sidewinder IC guidance and control sections. Naval Air Systems Command. N00019-68-C-00164.
- Dell Industries, Waycross, Ga. \$2,069,189. MK 76, MOD V practice bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3330.
- 28—Trustees of Columbia University, New York, N.Y. \$1,741,785. Marine geophysics research. Office of Naval Research.
- 20—Sylvania Electric Products, Mountain View, Calif. \$12,722,303. Countermeasure receiving sets. Mountain View and Santa Cruz, Calif. Naval Ship Systems Command. N00024-68-C-1023.
- North American Aviation, McGregor, Tex. \$3,297,420. Rocket motors for Shrike missiles. Naval Air Systems Command. N00019-67-C-0633.
- Hughes Aircraft, Culver City, Calif. \$2,275,000. Airborne weapons launchers. Naval Air Systems Command. N00019-68-C-0160.
- Raytheon Co., Portsmouth, R.I. \$1,114,300. Maintenance services for sonar systems and conduct of training courses. Naval Ship Systems Command. N00024-68-C-1090.
- 30—Simplex Wire & Cable Co., Newington, N.H. \$4,500,000. Manufacture of undersea cable. Naval Electronic Systems Command. N00039-67-3573.
- Texas Instruments, Dallas, Tex. \$1,561,807. Equipment for AN/APQ116 radar systems used on A-7A aircraft. Aviation Supply Office, Philadelphia, Pa. N00388-67A-2001-0225.



DEPARTMENT OF THE AIR FORCE

- 1—LTV Electrosystems, Salt Lake City, Utah. \$2,292,870. Manufacture of communications test equipment. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. AF 34601-67-C-5346.

- General Electric, West Lynn, Mass. \$1,523,283. Manufacture of components for the control assembly for F-111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0258.
- General Motors, Flint, Mich. \$1,782,697. Manufacture of spark plugs for various types of aircraft engines. San Antonio Air Materiel Area, (AFLO), Kelly AFB, Tex. AF 41608-68-C-0096.
- Collins Radio Co., Richardson, Tex. \$1,417,000. Manufacture of airborne antenna components. Warner Robins Air Materiel Area, (AFLO), Robins AFB, Ga. AF 09603-67-C-3177-P001.
- North American Aviation, Anaheim, Calif. \$1,000,000. Maintenance, repair, overhaul and modification of the Minuteman guidance and control system. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. AF 04701-68-C-0013.
- 2—Philco-Ford Corp., Palo Alto, Calif. \$8,238,410. Work on communications satellites. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. AF 04095-67-C-0139.
- Talley Industries, Mesa, Ariz. \$3,142,500. Production of aircraft engine starter cartridges. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0338.
- 3—Fairchild Hiller Corp., Farmingdale, N.Y. \$1,866,400. Manufacture of modification kits for F-105 aircraft. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. AF 04606-68-J-001.
- Analytical Services, Inc., Falls Church, Va. \$1,491,700. Analytical studies pertaining to the application of weapons systems. Air Force Office of Scientific Research, AF 49-038-1259.
- 6—Lear Siegler, Grand Rapids, Mich. \$3,749,524. Manufacture of airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0979-P002.
- LTV Electrosystems, Inc., Greenville, Tex. \$11,706,953. Inspection, repair and modification of C-121 aircraft. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. AF 04606-68-C-0331.
- Aerodex, Inc., Miami, Fla. \$4,109,944. Overhaul of aircraft engines. San Antonio Air Materiel Area, (AFLO), Kelly AFB, Tex. AF 41608-68-D-0016.
- 7—Spacecraft Inc., Huntsville, Ala. \$1,754,000. Work on the Titan II instrumentation system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. 04 (695)-1063.
- Goodyear Tire & Rubber Co., Akron, Ohio. \$3,224,725. Manufacture of wheels and brakes for C-130 aircraft. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. 33657-67-A-0038-0P40.
- Applied Technology of ITEK Corp., Palo Alto, Calif. \$2,101,523. Manufacture of airborne radar components. Warner Robins Air Materiel Area, (AFLO), Robins AFB, Ga.
- 8—Boeing Co., Renton, Wash. \$15,000,000. Four 707-320C jet aircraft for the German Air Force. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0208.
- 13—General Electric, Syracuse, N.Y. \$2,720,150. Manufacture of height-range finder antennae. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. AF 34601-67-A-1470.
- Hallcrafters Co., Chicago, Ill. \$1,050,881. Production of spare parts for electronic counter-measure equipment. Warner Robins Air Materiel Area, (AFLO), Robins AFB, Ga. AF 33 (657)-15751.
- 14—Continental Aviation & Engineering Corp., Detroit, Mich. \$4,624,672. Production of J-69 engines. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0053.
- 15—Quiller Construction Co., Los Angeles, Calif. \$1,912,000. Construction of 124 family housing units at Vandenberg AFB, Calif. Base Procurement Div., Vandenberg AFB, Calif. AF 04684-68-C-0009.
- 10—Straza Industries, El Cajon, Calif. \$9,833,924. Manufacture of bomb fin assemblies and related data. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. AF BOA-F04006-68-A-0011-2P01.
- Continental Aviation and Engineering Corp., Detroit, Mich. \$1,640,646. Target

drones. AF 33657-68-C-0037 \$2,081,983. Army drones. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-33657-68-C-0244.

- 17—American Electric, Inc., La Mirada, Calif. \$1,478,215. Production of fuse assemblies for aircraft ordnance. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. AF 42600-68-C-1169.
- Maxson Electronics Corp., Macon, Ga. \$1,405,093. Production of fuse assemblies for aircraft ordnance. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. AF 42600-68-C-1524.
- United Aircraft, East Hartford, Conn. \$1,016,201. Manufacture of spare parts for J-57 aircraft engines. San Antonio Air Materiel Area, (AFLO), Kelly AFB, Tex. AF N388-69000A.
- 20—Honeywell, Inc., Hopkins, Minn. \$0,655,400. Manufacture of aircraft bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0693.
- 21—Hayes International Corp., Birmingham, Ala. \$2,265,700. Production of aerial tow targets. Air Proving Ground Center, (AFSC), Eglin AFB, Ala. 08051-68-C-0211.
- 22—Martin Marietta, Denver, Colo. \$88,632,664. Design, fabrication, assembly, test and delivery of Titan IIID space boosters and associated ground support equipment. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04690-67-C-0041.
- McDonnell Douglas Corp., St. Louis, Mo. \$1,671,850. Engineering services, trial installation and flight testing of airborne camera equipment. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. AF 34601-67-A-2188-OPDU.
- General Electric, West Lynn, Mass. \$1,111,908. Manufacture of spare parts for T-64 aircraft engines. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. AF 3857-67-C-0054.
- Goodrich Co., Akron, Ohio. \$1,062,000. Production of aircraft tires. Ogden Air Materiel Area, (AFLO), Hill AFB, Utah. AF 42600-68-D71801.
- RCA, Burlington, Mass. \$7,276,500. Engineering and production of transportable communication control centers. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 10628-68-C-0089.
- 27—American Electronic Laboratories, Colmar, Pa. \$1,170,000. Manufacture of electronic countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- 20—Hycan Mfg. Co., Monrovia, Calif. \$1,355,000. Manufacture of airborne camera equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0470-P003.
- Hek Corp., Palo Alto, Calif. \$1,184,080. Production of airborne radar components for F-4 aircraft. Warner Robins Air Materiel Area, (AFLO), Robins AFB, Ga. AF 04606-67-A-1813.
- Sanders Associates, Nashua, N.H. \$1,050,000. Manufacture of airborne countermeasure receiver subsystems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0079-P001.
- 30—M.I.T., Cambridge, Mass. \$32,895,000. Research & development of advanced electronic programs. Lexington, Mass. Electronic Systems Div., (AFSC), L.G. Hanscom Field, Mass. AF 19 (628) 5107.
- Quantic Industries, San Carlos, Calif. \$1,278,651. Development, fabrication and qualification of a provision horizon sensor system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04701-68-C-0064.

OFF-SHORE PROCUREMENT

- 8—United Aircraft of Canada, LTD, Longueuil, Quebec. \$1,202,140. Spare parts for R-4360 aircraft engines. San Antonio Air Materiel Area, (AFLO), Kelly AFB, Tex.
- 20—Littion Systems, Canada, Ltd., Rexdale, Ontario, Canada. \$2,146,180. Weapons release system AN/ASQ-91 applicable to F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

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Beginning Jan. 2, the U. S. Department of Commerce Patent Office will publish a weekly journal containing abstracts and drawings of U. S. patents.

The objective of the journal is to provide non-patent oriented scientists, engineers and businessmen easier access to the important technical information contained in patents. For this purpose, abstracts have been required as part of patent applications since Jan. 1, 1967.

The abstracts take the place of "claims" in the Patent Office's *Official Gazette*, and the new journal is an extract from the patent section of this publication. The *Official Gazette* will continue to best serve the patent practitioner.

The new *Official Gazette Patent Abstracts Section* is being offered on a six-month basis (January through June 1968) by the U. S. Government Printing Office, Washington, D. C. 20402, for \$27. Regardless of date of subscription entry, the full price will be charged and back issues will not be furnished. Single copies will be sold for \$1.25 each.

The Editor



February 1968





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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301, telephone, (202) OXford 5-2709.

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Boundless Frontiers

Americans have been famed for their adventurous spirit since the first settlers stepped ashore on the rocky coast of the new world over 300 years ago. The enterprising quality, which stimulated the pilgrims to undergo all kinds of hardships in the search of a better way of life, was also the driving force behind the westward movement of the early pioneers. The continual push of those rugged Americans into new frontiers led to the development of a vast wilderness which has resulted in one of the strongest nations in the history of the world.



This pioneering trait continues in America today with the work being carried on at the South Pole and with extensive efforts to reach into space.

At the same time, we are now beginning to assault the world's last undeveloped wilderness—the oceans of the globe, the last frontier on Earth.

This venture is filled with both promise and risk. The promise is an almost bottomless well of natural resource. The risk is the one ever present in international competition. For we are not alone in our belated recognition that oceanography is the nucleus of a critical totality—national strength at sea.

But how much do we really know about the three-fourths of our planet that is covered by water to depths as great as seven miles, a boundless

frontier extending from the Arctic Ocean to the Antarctic Continent?

An examination of man's continuous struggle with the sea indicates that much of the helplessness, which he has experienced in the past, could have been avoided had he possessed greater knowledge and understanding of the oceans. One of the greatest oceanic tragedies of our time could have been prevented if, in 1912, we had known more about the currents of the North Atlantic, their intensity, tracks, and springtime consistency. On the night of April 14 of that year, the ocean liner Titanic side-swiped an iceberg suffering such extensive damage that she sank within a few hours, carrying over 1,200 people to frigid graves.

A more recent example of man's inability to cope with the forces of the deep occurred in April 1963, when the nuclear attack submarine, USS Thresher, disappeared during a routine test dive east of Cape Cod, Mass. At about the same time that this tragedy occurred, the U.S. space probe, Mariner II, was passing by Venus, a distance of over 100 million miles from Earth, sending back scientific information about the planet. Back on Earth, however, we were helpless in locating the doomed submarine which lay on the ocean floor, a mere 8,400 feet from the surface.

Thus it can be seen that knowledge of the ocean is more than a matter of curiosity. Ability to understand this environment, predict its behavior, use its potential in peace, and apply its potential in war is vital to American security and progress.

Oceanography, the study of the sea, is not one science but rather an application of all the earth sciences—physical, chemical, biological and geological.

The oceanographer's concern is not only the ocean depths but also the lands beneath, the life nourished by the ocean and its influence on our total environment. Ultimate control

of weather phenomena, created by the interactions of the oceans, the atmosphere and the sun, is dependent upon more complete knowledge of ocean space.

The oceans began, according to theory, about three billion years ago as the earth's surface temperature dropped below 100 degrees centigrade. In addition to the moisture condensation from the clouds, it is believed that water was released to the surface by volcanic action, bringing with it considerable quantities of salt from the interior of the earth.

Today, if the earth's surface was



rearranged to eliminate peaks and valleys to form a perfect sphere, the accumulation of water could cover the land one and one-half miles deep.

Over 100 years ago, U.S. Navy Lieutenant Matthew F. Maury became the world's first true oceanographer. The information that he systematically gathered and analyzed became a collection of maritime secrets used by the captains of the clipper ships. From the data he collected on ocean currents and winds, he was able to chart the fastest trade routes for the clippers to follow.

Seeing the advantages of scientific study of the ocean, the British undertook the first world-wide oceanographic survey, in 1872, with Her Majesty's Ship Challenger.

Knowledge gained from the survey revealed that continental shelves

constitute about seven percent of the land beneath the oceans. It was discovered that these shelves slope about 10 feet per mile and extend varying distances seaward from the continental shores. For instance, the shelf extends only one mile off the coast of California, while off northern Europe and Siberia it extends to about 750 miles, with the terrain slope increasing sharply at the edge of the shelf. This area is called the continental slope. Beyond the continental shelves and slopes, in the deep-sea area, lies the ocean floor, over half the earth's land, at an average depth of more than 10,000 feet.

Actually, "floor of the ocean" is a misleading term. It implies something flat and featureless. The shape of the bottom is anything but flat. With its continental shelves, mid-ocean range, truncated islands and deep canyons, the floor of the Atlan-



tic Ocean presents some of the most rugged terrain found anywhere in the world.

The floor of the ocean, from the continental shore, is covered by sediment accumulated over millions of years. It contains a wealth of history of the past life of our planet. For instance, it has been learned that vast areas of the Pacific were once blanketed by a thick layer of ash from a massive volcanic eruption that occurred between 60,000 and 80,000 years ago. By core sampling of the sediment, it has been found in some areas that about one inch reveals 1,000 years of history. In other areas, a 30-foot length core reveals history as far back as nine million years.

Although study of oceanography is receiving more attention each year, even today our maps and charts of the ocean floor are very primitive—

comparable to land maps of the 18th century. In fact, only two percent of the oceans are charted adequately.

Another aspect of oceanographic study is the movement of the seas, including sub-surface as well as surface currents. Ocean currents might be compared to rivers as we know them on land. One such current has been discovered two miles beneath the water surface in the Bay of Bengal. It is estimated to carry a volume of water 25 times that of the Mississippi River. Meteorological studies have shown that changes in large scale weather patterns, over periods of weeks to many years, are closely related to changes in the temperature distribution of the water layers near the surface of the sea.

Scientific ocean current observations indicate that improvements in long range weather forecasting can be made through studies of the interactions between the oceans and the atmosphere.

The sea behaves more sluggishly than the air. For instance, the Gulf Stream, 40 miles wide and 3,000 feet deep, flows at the rate of 50 miles a day; in contrast, some of the upper atmosphere winds are known to move at 100 miles an hour in a band 400 miles wide and 20,000 feet in depth.

In the late 1700s, Benjamin Franklin prepared a chart of a portion of the Gulf Stream, giving a basis to the concept of thermometrical navigation by comparing, with a common thermometer, temperatures of water dipped up in an old oaken bucket.

The Humboldt Current, which exerts a direct influence on the west coast of South America, is another ocean river that scientists have been able to chart. As this current flows up the coast, it keeps the coast line arid. However, a small shift in the course of this current brings torrential rains and floods which has resulted in economic disaster to many coastal communities.

The ocean has been referred to as a global thermostat, and there is no doubt that the interactions among the ocean, the atmosphere and the sun actually create weather. Consider the Gulf Stream and the Humboldt Current, along with the circulation

patterns of the atmosphere. What would happen if this natural balance between ocean and atmosphere were upset? Suppose we had a deflection or diversions, or a warming or cooling of currents? The cold regions might become temperate. And the climate at Miami Beach might become polar bear weather.

One of the advantages to be gained from oceanography is increased accuracy of the long range weather forecasting. If weather could be more accurately predicted, great economic benefits could result in such areas as planting and harvesting crops, planning seasonal fuel transportation and storage, proper timing of building and road construction, and flood and drought protection. A 50 percent improvement might well produce savings of two billion dollars a year.

Increased oceanographic data will also make it possible to compile more



detailed forecasting of tidal waves, or tsunami as they are called by scientists, resulting in speedier alerts to coastal communities which might be affected. The tsunami is produced by a sudden, large scale motion of a portion of the ocean floor or the shore by volcanic eruption, earthquake, or landslide. These erratic surges have struck in many parts of the world, and have cost thousands of lives and millions of dollars in property damage.

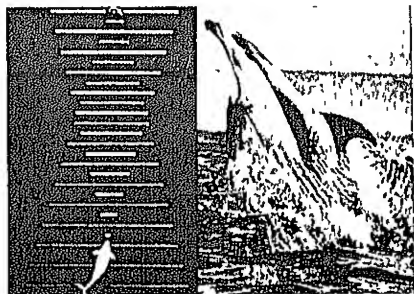
In 1964, a giant tidal wave lashed the western shores of Alaska leaving seaport areas in a shamble of wreckage and debris. Advance knowledge of the approaching tsunami gave Alaskans a chance to protect themselves and to prevent greater damage by applying precautionary measures.

The ocean as a source of food and other useful resources is another

benefit to be gained from exploiting the sea frontier. However, we know surprisingly little about the nature and behavior of the life forms found in the sea. It would be of great benefit if fishermen could learn the mysteries of fish migration, or answer such questions as where the huge California tuna and Alaskan salmon have gone in the past few years.

Every year thousands of walrus congregate in the Aleutian Islands, then they disappear. Where do they go? To what oceanic area do they migrate? Wherever it is, sea life there must be in abundance, for the ocean furnishes their food. Here is another unsolved mystery of the sea. Increased study of the biological aspects of oceanography may give us the answer.

Studies of the shark and the porpoise may lead to advances in naval ships and underwater weapons de-



sign. Experiments with the porpoise, for example, have revealed that these animals can navigate by a built-in sonar which emits rapid sound waves from the lower part of the head. These appear to serve as both detector and range finder. The Navy has found that the porpoise emits 80 pulses per second in search of food, and that these pulses abruptly diminish to 30 pulses per second as he closes in on his victim.

Navy scientists have also determined that the dolphin has extraordinary powers of navigation and homing sense. If the secret of the dolphin's efficiency could be discovered, ship and torpedo design could be revolutionized.

The oceans of the world could also provide a solution to the ever looming threat of over-population in the near future. In addition to the fish avail-

able in the sea, there are various kinds of vegetation and minute sea life. Many may prove to be palatable and nutritious. Perhaps it is plankton—the main source of nutrition for fish. A few food derivatives from mass cultivation of sea water algae have been successfully used in bread, noodles, soup, and even ice cream.

However, the most important undeveloped potential food source for man is protein from the fish, lobster and other seafood that inhabit the oceans. New methods of locating and attracting sea life will improve the efficiency of fishermen and produce larger catches.

We might expand the cultivation of fish farms, to include large oceanic regions, that could be placed under systematic and scientific control to increase reproduction and reduce losses. Man must inevitably turn to the sea for the food resources he needs. The sea not only constitutes more than two-thirds of the earth's surface, but it is also about 100 times more fertile than the land area.

The large shelf areas in the southern hemisphere are still untapped, and the deep water areas of both hemispheres are virtually ignored. It is not a question of abundance with the oceans, but rather a question of how to get the product to the consumer.

Not only do the oceans need to be explored to assess resources, but we must take the guesswork out of catching fish. Moreover, preservation methods, such as freeze drying, producing fish protein concentrates, or fish flour, need to be more widely accepted and used.

In this way, oceanographic research can help a hungry world feed itself.

Although not directly related to oceanography, parts of the world are thirsty, too. Like food, the growing world population, coupled with higher demands of industry and agriculture, requires new sources of fresh water.

While the world's supply of fresh water is approximately constant, the requirement will have doubled by 1980. Even now we are faced with the pressing need for fresh water in some areas. The only promising source appears to be in the conversion of salt water.

Such a method is now being used as a source of fresh water at the Guantanamo Bay Naval Station. The desalinization plant was installed three years ago when Fidel Castro turned off the local supply of fresh water, in a move to harass the base. The plant, installed to meet the demands of an emergency situation, is now helping to make the base self sufficient through sea water conversion. A very large scale, nuclear powered desalinization plant will soon be constructed off the coast of California.

In addition to food and water supply, the sea is a tremendous storehouse for at least 50 of the known elements. Cobalt has been extracted from lobsters, and copper is used in their physiological processes. Vanadium is in the blood of sea cucumbers, and certain mollusks use nickel in their life processes.



Even though the 38 pounds of gold dissolved in a cubic mile of sea water is not now recoverable, gold is also found in the sea floor, and efforts have already been made to mine it off the coasts of northern California and Alaska. It has been discovered that concentrations of manganese nodules cover vast regions of the central Pacific. Commercially exploitable deposits of phosphorite have been found off southern California.

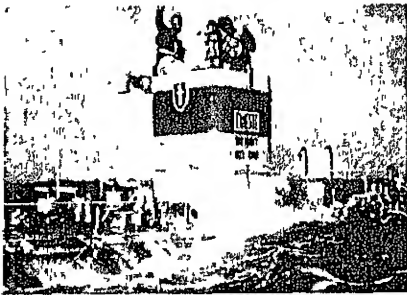
Quantities of diamonds have been discovered and are being mined from the continental shelf of the Republic of South Africa. One thousand carats are mined every day, with a predicted recovery of 5,000 carats a day when additional dredges are put into operation.

It has been estimated that 40 percent of the world's available petroleum is located under the continental shelves. Although 16 percent of the

petroleum used by the Free World now comes from beneath the sea bed, this vast reserve has been barely touched. In the United States, oil has been produced from offshore drillings in California, Texas and Louisiana.

Now let us take a look at some of the things being done to learn more about the earth's cubic miles of the oceans' space and the lands beneath them.

Man can descend and work four to six hundred feet into the sea with the aid of special underwater breathing equipment, and experiments at greater depths are planned. However, for extremely deep descents, the Navy has a bathyscaph, called the Trieste. Buoyed by a compartmented tank filled with lighter-than-water gasoline and ballasted with metal shot, the Trieste can descend about six feet per second clear to the bottom of the ocean floor. In 1960, the



Trieste, with two scientists aboard, journeyed six and one-half miles down into the Marianas Trench where the pressure is about seven tons per square inch.

U.S. Navy Lieutenant Don Walsh and Swiss designer and builder, Jacques Piccard, the two men making the descent, were motivated to risk their lives exploring such depths because, in Lieutenant Walsh's words, "We are in a grim race for time, with survival as the prize. Nothing can substitute taking trained minds and eyes into the environment to study the dynamics of the oceans."

At the tremendous depth of 37,000 feet, Walsh and Piccard were able to see living creatures moving around the ocean bottom, and also to determine that ocean currents are active at that level.

After the submarine Thresher was lost, the Secretary of the Navy char-

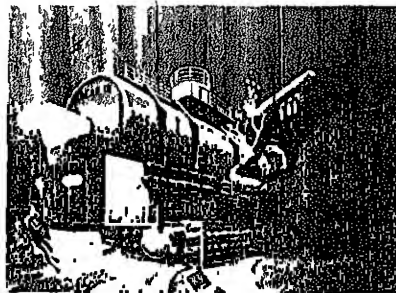
tered a group of oceanographic scientists and Navy experts to explore deep submergence systems. The mission of the Deep Submergence Systems Project is divided into two categories:

- To develop a quick capability of operating in, and recovering a vessel from, the continental shelf area—depths down to about 1,000 feet.
- To explore the ability to work in depths down to 20,000 feet.

Concurrently, the economic influence of ocean exploration began to work on industry. An example of independent industrial work in this area resulting in new environmental equipment is Deepstar, developed by Westinghouse, with an operating depth of 12,000 feet.

Alvin, another deep-water research vehicle sponsored by the Office of Naval Research and operated by Woods Hole marine scientists, will open to man's eyes for the first time one-sixth of the ocean floor—an area almost equal to that of the moon. Alvin is smaller and weighs less than the USS Holland, the Navy's first submarine launched in 1900, but will operate at depths a thousand times greater. On July 20, 1965, Alvin completed its first deep trials to 6,000 feet off Andros Island in the Bahamas.

The first phase of the Navy's "Man-in-the-Sea" program, SEALAB I, began in July 1964. Four Navy aquanauts spent 10 days working at 192 feet beneath the Atlantic surface, 26 miles southwest of Bermuda. They lived in a steel capsule, under pressure of 86 pounds per square inch, in an atmosphere that consisted of 80 percent helium and four percent oxygen.



The second phase of this program, SEALAB II, began in mid-August 1965. Working in the area around their undersea quarters, situated on the ocean bottom at a depth of 210 feet off La Jolla, Calif., 10 aquanauts evaluated experimental salvage techniques, conducted scientific research, and underwent physiological and performance tests for a period of 30 days.

SEALAB III, the third open ocean phase of the Navy's Man-in-the-Sea program, is scheduled for the summer of 1968. In this experiment, Navy aquanauts will test salvage techniques, engage in oceanographic and marine biological research, and undergo a series of physiological and human performance tests. The most complex ocean engineering experiment attempted to date, SEALAB III will be held 450 feet below the surface off the shores of San Cle-



mente Island, Calif., where five teams of eight men each will occupy an underwater habitat alternately for 12-day periods during the scheduled 60-day experiment.

Despite these efforts, it must be admitted that the United States, as well as most of the other nations in the world, has been slow to recognize the full potential of the oceans.

Even today, only a few universities offer a graduate education in the fields associated with oceanography. Approximately 17 universities in the United States offer study in oceanography on the doctoral level. The present graduation rate of doctorates per year will not sustain the effort required to meet the nation's needs in this field.

Although recognition of the potential has been slow, the challenge and

need are, at last, being defined. Technology is now pressing against the environment of the oceans, with oceanography as the tool and trained environmental scientists as the weapons.

The military and non-military applications of oceanography are numerous.

In the military field, an improved diving capability will provide a greater scope to such operations as amphibious beach preparations and explosive ordnance disposal. Anti-submarine warfare forces need more information about the ocean medium. Ocean-bottom mounted surveillance systems have been degraded in one form or another by surface dependency. Improved technology should bring results in easier service and more accurate bottom positioning. Mine warfare, weapons recovery, wave prediction, sonar forecasting, and many other military requirements could be bolstered by increased information about the ocean environment.

As our nuclear attack submarines go faster and deeper in the vast battlefield of ocean space, greater knowledge of the ocean is needed to develop undersea warfare tactics. The role of the submarine has progressed beyond anti-shipping and reconnaissance to include the pursuit of enemy submarines.

To obtain the knowledge needed to bolster these military programs, the Navy's oceanographic research objectives are being pursued by 27 universities, five Federal and four industrial laboratories, and the Oceanographer of the Navy. In addition, about 20 laboratories are pursuing, under research contracts, related programs, such as marine biology, marine meteorology, and coastal geography. Two research vessels and over a dozen survey ships carry out the Navy's oceanographic field work, and over 20 university-operated ships are now in operation.

In attaining its military objectives, the United States will gain both scientific and economic benefits. However, industrial ocean engineering is not yet supported by a broad enough technological base to fulfill our total national interest. As in the exploration of space, man is needed on the spot to observe and conduct experiments.

The Russian Bear is not hibernating in this field. For several years, the Soviets have been and are still exploring the ocean bottoms in our own backyard. Today, Soviet Russia has about 200 oceanographic ships. This is more than three times the number the United States has available. This vast fleet does not include the hundreds of Soviet fishing trawlers known to be engaged in oceanographic exploration.

The late President Kennedy summed up our need for increased ocean knowledge in March 1961 when he said, "We are just at the threshold of our knowledge of the oceans. Already their military importance, their potential use for weather predictions, for food, and for minerals are evident. Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge upon it."

In March 1967, President Lyndon B. Johnson, in his first Report to the Congress on Marine Resources and Engineering Development, stated, "The depth of the sea is a new environment for man's exploration and development, just as crossing the West was a challenge in centuries past.

"We shall encounter that environment with the same conviction and pioneering spirit that propelled ships from the Old to the New World.

"We shall bring to the challenge of the ocean depths—as we have brought to the challenge of outer space—a determination to work with all nations to develop the seas for the benefit of mankind."

The foregoing article is based upon a presentation, titled "Boundless Frontiers," prepared by the Office of the Chief of Naval Operations.

"Boundless Frontiers" is a 35mm slide presentation consisting of 80 color slides and associated text. Copies may be obtained on a library-loan basis from the Commandant of your nearest Naval District (see addresses in next column) or by writing direct to:

Director, Special Studies and Presentations Group (Op-09D)
Office of the Chief of Naval Operations

Department of the Navy
Washington, D.C. 20350

The Editor

Oceanography Film Available to Public

"Mission Oceanography," a new U.S. Navy color documentary film, produced by the Public Affairs Office of the Oceanographer of the Navy, is available for loan to the general public free of charge.

The film traces the history and development of oceanography in the United States and other maritime nations.

Since its release, the film has been recognized as an outstanding documentary science film receiving awards at the American Film Festival, the International Maritime Film Exposition in Italy, the ANZAAS International Scientific Film Exhibition of Australia, and others.

Prints of the film can be obtained from Public Affairs Offices of Naval District headquarters at the following addresses:

First Naval District
495 Summer St.
Boston, Mass. 02110

Third Naval District
90 Church St.
New York, N.Y. 10007

Fourth Naval District
U.S. Naval Base
Philadelphia, Pa. 19112

Fifth Naval District
Norfolk, Va. 23511

Sixth Naval District
U.S. Naval Base
Charleston, S.C. 29408

Eighth Naval District
New Orleans, La. 70140

Ninth Naval District
Building 1
Great Lakes, Ill. 60088

Eleventh Naval District
San Diego, Calif. 92130

Twelfth Naval District
Federal Office Building
San Francisco, Calif. 94102

Thirteenth Naval District
Seattle, Wash. 98115

Naval District Washington, D.C.
Building 200
Washington Navy Yard
Washington, D.C. 20390

The Challenge of the Marine Sciences

Vice President Hubert H. Humphrey
Chairman, National Council on Marine Resources
and Engineering Development

The President's initial recommendations, set forth in his report to the Congress in March 1967, reflect our awareness that the benefits of the sea can and must more and more serve the needs of our growing and increasingly urbanized society—the needs for food, minerals, energy and recreation; for commerce and economic growth; and for strengthened national security and improved international understanding.

Let me briefly review some of these challenges that face our nation and the world today:

- There are one and one-half billion hungry people in the world. The full food potential of the seas, seriously neglected in the past, must be realized to combat famine and despair. Technologies now at hand can be directed toward increasing the world's fishing catch and enriching the diets of the underfed.

- Seventy-five percent of our population lives along our coasts and Great Lakes. Nine of our 15 largest metropolitan areas are on the oceans and Great Lakes and three are on ocean tributaries. Twenty million children live in these metropolitan areas within sight of potential water recreation areas, but are often denied their use. Only three percent of our ocean and Great Lakes coast line has been set aside for public use or conservation.

- More than 90 percent by value of our intercontinental commerce travels by ship. Although there have been rapid changes in the character of ocean cargoes and technologies of cargo handling, the average age of our port structures is 45 years and the average age of our merchant ships is 19 years.

- The continuing threats to world peace require our Navy to maintain a high level of readiness and versatility through a sea-based deterrent and undersea warfare capability. Middle East conflicts following closure of

the Gulf of Aqaba vividly emphasize the urgent need for a strengthened code of international law of the sea.

- Thirty million Americans swim in the oceans, 11 million are salt-water sport fishermen, and eight million engage in recreational boating in our coastal states, yet industrial wastes being dumped into ocean tributaries will increase seven-fold by the year 2000 unless there are drastic changes in waste handling.

- Ocean-generated storms cause millions of dollars of damage annually along our coasts, but marine weather warning services are available to less than one-third of our coastal areas.

During the past year I have discussed these challenges with scientists, engineers, business leaders, and local, state, and Federal officials in Washington, at oceanographic installations in nine coastal states, and in the capitals of six countries of Western Europe and one in Asia.

The problems of the sea are complex, and they involve every type of concern and institution that exists on the landward side of the shore line. Thus we must solicit the varied ideas, the advice, and the participation of universities, industry, and all elements of Government, just as we have found this mixture an essential ingredient for the vitality and progress of our nation on shore.



Vice President Hubert H. Humphrey

For seven years, the Congress and the scientific community have insisted on more intensive action to reap the benefits of the sea. Now the Administration is responding to the Congressional mandate—building on long-standing capabilities within 11 Federal departments and agencies and accelerating our progress with a new enthusiasm and determination, a new sense of direction and momentum.

We are:

- Identifying goals, and milestones to reach these goals.
- Setting priorities.
- Developing purposeful programs to bring our ocean interests into balance with our overall national interests.
- Clarifying agency responsibilities to develop individual and collective capabilities.
- Mobilizing our resources—government, academic and industrial.

We singled out a number of marine science areas for particular emphasis during FY 1968 and, by concentrating diverse projects on a selected number of objectives, have begun to obtain a greater effect from a still modest enterprise. We are critically examining the opportunities for FY 1969, realizing that current actions will significantly affect the course we chart during the next several years.

Certain of these programs are the responsibility of a single agency but, increasingly, new programs cross agency lines. The National Council on Marine Resources and Engineering Development is taking steps to prevent unnecessary duplication and to insure that program gaps do not occur.

We are fortunate to have a close association with the advisory Commission on Marine Science, Engineering, and Resources. While the com-

(Continued on Page 35)

Marine Science Affairs: Impetus and Promise

Dr. Edward Wenk Jr.

Vice President Hubert H. Humphrey in the article beginning on the preceding page stated that "The continuing threats to world peace require our Navy to maintain a high level of readiness and versatility through a sea based deterrent and undersea warfare capability."

Defense is one of the most serious challenges which the Vice President described as facing our nation today, but there are others, too. Two common denominators in these challenges are the oceans and man. The Vice President also wrote, "The problems of the sea are complex, and they involve every type of concern and institution that exists on the landward side of the shore line."

Despite our ocean-oriented beginnings, this nation let its interest in marine affairs wax and wane. Occasionally, in the course of human events, man looks at his world and himself, and thoughtfully and deliberately charts his course. That is what this nation is now doing with regard to the marine sciences. The problems are not so much nautical as they are technological and social. They are human affairs occurring in a marine environment. What is significantly different about our approach is a specific landmark of impetus, a collective national decision expressed through the Marine Resources and Engineering Development Act of 1966.

Ocean Science Policy

With that Act, the United States acquired, for the first time, an explicit national policy "to develop, encourage and maintain a coordinated, comprehensive, and long-range national program in marine sciences for the benefit of mankind." This legislation marked a turning point in our nation's interests in the sea. It recog-

nized that previous investments in the quest for scientific knowledge have borne fruit, and that we should intensify our efforts to utilize marine resources more deliberately and to strengthen ocean-based industries to serve our national purpose.

During the past seven years or so, this nation developed world leadership in scientific achievements, an unexcelled fleet of research ships and laboratory facilities, and a vigorous base of professional talent. Now we seek to apply these capabilities to the broad purposes of our nation—to the economic, political and social goals that transcend the geographic demarcation between land and water.



Dr. Edward Wenk Jr. is the Executive Secretary of the National Council on Marine Resources and Engineering Development. Prior to this appointment Dr. Wenk headed the Science Policy Research Division of the Library of Congress. Early in his career he served at the David Taylor Model Basin where he was responsible for the Navy's ship structural research program. Later at the Southwest Research Institute, San Antonio, Tex., he originated the concepts for deep-running submarines and designed the Aluminaut research submersible.

Man's problems do not stop at the water's edge; neither should the solutions. Thus we find in marine science affairs the same diversity and complexity of scientific disciplines and techniques, the wide range of activities and institutions that characterize man's activities on land. These concern national security; maritime transportation; development of fishery resources, minerals, oil and gas; urban redevelopment; recreation; pollution abatement and control; health and safety; expansion of man's knowledge about his own environment; domestic economic growth; foreign economic development; and international cooperation and collaboration. It is, thus, not surprising that marine science activities, evolved historically in 29 bureaus of 11 different Federal departments and agencies, are of direct interest to a number of different Congressional committees, numerous state, regional and international organizations, many universities and a wide variety of industries.

This new legislation provided a coherent purpose to a diversity of activities, institutions and competing interests that derive a unity from a common marine environment. The Act also established a clear focus for national leadership. No new operating agency was established. Pending completion of studies now under way, the present Federal agency structure is continued, with responsibility for overall policy planning and coordination placed in the Office of the President, with advice and assistance of the National Council on Marine Resources and Engineering Development. As one consequence of the legislation each Federal agency has reviewed its own programs, its priorities, and its organization. At the same time the agencies are endeavoring to meet these goals individually, they are working collectively through the council.

Marine Sciences Council

In accordance with the legislation, the National Council on Marine Resources and Engineering Development is headed by the Vice President and is composed of five cabinet officers and three department and agency heads having significant maritime-related activities (see Figure 1).

The role of the council is to assist the President by identifying government-wide issues, by evaluating alternative policies, and by formulating a balanced and consistent set of marine science priorities and programs. The council has begun to:

- Delineate marine science activities in relation to national goals.
- Develop a comprehensive program to be conducted by 11 Federal departments independently or in cooperation with states, academic institutions, and industry.
- Designate and fix agency responsibilities and facilitate cooperation among Federal agencies.
- Examine appropriate roles for public and private investment.
- Undertake legal studies of problems arising out of the management, recovery and control of marine resources.
- Initiate long-range studies of the potential benefits of marine science activities to the U.S. economy, security, health and welfare.

Implementation is entirely the responsibility of the operating agencies, but the council seeks to assist them in building on existing strengths in every way possible. When missions cross agency lines, however, the council may designate a lead agency to assume responsibility for inter-agency planning and coordination.

Nine "Initiatives"

The President's first major assignment to the council was to request recommendations for the FY 1968 budget. Nine areas were isolated for special emphasis and set forth in the President's first report on marine sciences.

They concern:

- A new food-from-the-sea program as part of the war on hunger, including overseas demonstration projects utilizing fish protein concentrate.
- Immediate implementation of the Sea Grant program to strengthen ed-

ucation, applied research and information transfer.

- A new study for improved collection and dissemination of oceanographic data.
- Designation of the Chesapeake Bay as a model to study the effects of estuarine pollution and remedial measures.
- A pilot plan for offshore minerals exploration.
- An expanded ocean observation system to improve near-shore weather prediction for small boats and oil facilities, and accuracy of long-range forecasting.
- A strengthened program of deep ocean technology, especially to develop a future capability to recover lost equipment.
- A new ship to accelerate research in sub-Arctic waters.
- Programs for international cooperation to promote peaceful use of the oceans.

Marine Sciences Budgets

To place these priority efforts in perspective, the Government's total activities in marine science and technology have also been examined, and the total recommended to the Congress for FY 1968 was \$462 million, up 13 percent from the previous year. These funds are the minimum

necessary to expand efforts to understand the sea and develop its resources, and to enhance capabilities of local government, universities, and private industry to join in this vital enterprise.

This \$462 million, incidentally, represents less than three percent of the \$17 billion proposed for FY 1968 for Federal research and development across the board. Considering the wide variety of purposes these funds must serve, we have endeavored this first year to improve overall effectiveness by deploying existing capabilities around a limited number of objectives. We are doing this by:

- Utilizing fully all the resources currently engaged in various facets of oceanography, public and private.
- Developing policies and coordinating programs to attain maximum effectiveness, without sacrificing distinctive imagination and initiative of each participant.
- Inviting fresh ideas from all sectors of our society.
- Fostering collaboration among Federal, state, and local entities, between the United States and other countries, and between public and private sectors.

Let me elaborate on the scope and content of several initiatives to illustrate how we have selected maritime

National Council on Marine Resources and Engineering Development

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Executive Secretary:

Edward Wenk, Jr.

Figure 1.

activities which contribute to national goals, and how programs and agency responsibilities were developed.

Problem: Hunger

The problem of a world population that out-paces food production impinges critically on our nation's interest and, consequently, the United States has a long-standing policy to wage war on hunger.

Every possible approach is required to correct the world protein deficiency. The food-from-the-sea program is a new effort to bring fish protein to undernourished people. The fisheries potential of the sea as a protein source has been recognized for many years, and it now provides a new opportunity for the United States to provide world leadership in combatting one of the most compelling problems facing mankind. This program is a plan for action that could be developed promptly and economically, with available or emerging technologies and within the frame-

work of existing institutions. It should also upgrade and assist domestic fisheries and fish processing industries through the development of markets for species not now commercially caught and for new products, and through an expanded knowledge of the fishery stocks of the world oceans.

Problem: Defense

A second area of increased emphasis relates to the capability of our Navy to operate in the deep oceans. This initiative must be considered in the perspective that defense will continue to present a major requirement for ocean sciences and engineering. Such requirements anticipate that future strategic forces are likely to rely heavily on ocean-based systems, and that we need to continue updating anti-submarine capabilities. Both operations are intrinsically limited by the understanding of environmental conditions which affect performance of surveillance sensors and weapon systems.

Operations at great depths are related to broad defense objectives. Both the loss of the USS *Thresher* and the loss of an unarmed nuclear weapon near Spain revealed limitations of our deep ocean engineering capability. Current Navy efforts in deep submergence, both for the recovery of lost equipment and to provide a general deep ocean engineering capability, are thus being strengthened.

Problem: Data

A third area concerns upgrading of the nation's oceanographic data system. The national flow of information from collector to consumer is the life of marine research. Data and its handling must meet the needs of users. Data can help scientists to understand complex ocean phenomena, marine life and the ocean/atmosphere interaction, and technologists to apply knowledge to many practical ends.

Problem: Education

A fourth area of special emphasis derives from the National Sea Grant College and Program Act of 1966. This legislation is aimed at advancing education, training, applied research and information transfer—in phase with accomplishment of the overall purpose of a viable marine sciences activity. The National Science Foundation is administering the program, the only operating program created by the contemporary marine sciences legislation.

Problem: Sub-Polar Work

As a final example of our areas of special emphasis, the council recommended utilization of a proposed replacement vessel for the ice patrol in sub-polar oceanographic research. This particular research field has been somewhat neglected. It requires special instruments and ice traversing capabilities. The Coast Guard proposed that the replacement ship for the over-age *Evergreen* could simultaneously be equipped as a specialized vessel for work in these regions, while serving its patrol functions. The Congress has postponed this item, which we hope will be taken up later.

Since formulating these FY 1968 recommendations, the council has

Program for Marine Sciences and Technology

Summary by Major Purpose

(In millions)

	Actual FY 1966	Estimated FY 1967	President's Budget FY 1968
International cooperation and collaboration -----	\$ 5.1	\$ 7.1	\$ 7.4
National security -----	125.4	179.7	191.6
Fisheries development and seafood technology -----	38.7	51.5	49.2
Transportation -----	10.4	19.2	27.8
Marine pollution abatement and control -----	8.4	8.5	9.5
Health -----	5.1	6.6	4.2
Minerals, chemicals, water and energy resources -----	3.8	5.4	5.8
Recreation -----	10.3	11.5	13.6
Shore stabilization and protection -----	1.2	1.5	1.7
Multipurpose activities:			
Oceanographic research ¹ -----	71.6 ²	55.0	73.2
Education -----	2.2	3.3	5.5
General purpose ocean environmental observation and prediction services ³ -----	13.7	15.6	21.1
Mapping, charting and geodesy -----	32.3	33.7	39.1
General purpose nuclear power engineering development -----	3.5	8.7	10.5
National data centers -----	1.7	1.8	2.1
Total -----	\$333.4	\$409.1	\$462.3

¹ Research beneficial to more than one of the headings above.

² Includes Project Mohole which was discontinued in FY 1967.

³ Activities supporting more than one of the major purpose categories.

studied a number of separate policy and program issues. Those made public concern such matters as the marine resources resolution introduced last fall at the United Nations General Assembly, calling for examination by the Secretary General of international marine science activities; initiatives for Latin American cooperation, announced by President Johnson at Punte del Esta; a joint study by the Departments of Interior and Transportation concerning Torrey Canyon-type pollution incidents; a recommendation that the Navy's Transit satellite system be made available for oceanographic and commercial ships, and that the Department of Transportation be assigned responsibility to develop plans for an updated national navigation plan for civilian use.

Search for Solutions

In accordance with terms of the legislation, the council has initiated a number of legal studies to analyze the current framework of international and domestic law that affects sovereignty on the seas and development of their resources. We are examining implications of possible changes to such legal regimes as they would help serve our national interests by advancing the objectives of the Act.

We are now looking ahead to the next fiscal year. Our present studies will affect the future course and speed of the nation's program in marine sciences for almost the next two years.

In the international area, we are considering how other nations may join the United States with funds and manpower for joint exploration of the sea. Both the developing and the developed nations can contribute and benefit from these activities. We are examining which programs can best benefit from these activities. We are examining which programs can best be conducted in concert with other nations, and whether individual programs should be on a bi- or multi-lateral basis.

We are considering the appropriate role of the Federal Government in relation to states. Detecting a widespread and spontaneous surge of local initiative, we are examining means by which local areas may

analyze their special problems and coordinate their local interests with those of the Federal Government.

We are examining Government/industry roles and relationships, especially to encourage private initiative to develop resources on public lands of the continental shelf.

Advisory Role

The council operates as a board of advisors to develop recommendations for the President. Issues and action alternatives are based on working papers reaching it through the council secretariat. These may be initiated in one of the member agencies, through outside studies, or by the council staff. Advice and new ideas are also solicited from authorities in various fields who serve as consultants, from the many varied groups of our marine sciences community, such as the National Academy of Sciences, National Academy of Engineering, numerous professional groups, and governors and state planning officials.

Where policy or program activities cross agency lines and are of continuing nature, it has been desirable to develop proposals for council action through a committee structure. These have been established on a selected basis as the minimum necessary to achieve purposes of the council. These committees concern:

- Marine research, education and facilities.
- International affairs.
- Exploration and environmental prediction services.
- Multiple uses of the seashore.
- Food from the sea.

The Federal Government's program can be regarded as the sum of its parts. But with Presidential and Vice Presidential leadership to develop goals and provide a new momentum to the overall effort, to minimize effects of duplication and, especially, to take advantage of fresh ideas that may have in the past fallen in the gaps between agencies, we are striving to make the total effort more than the previous sum of the parts.

We are beginning to sharpen the tools for this purpose; to expand our knowledge of the marine environment; to utilize the advanced technology associated with a highly industrialized society; to develop the manpower and mobilize resources for a comprehensive, ocean-based program; to establish a framework of law that will facilitate work on the continental shelf and in the deep oceans; and to draw together, as partners, Government, industry, and the academic community. In the past, they have proven a strong, vibrant team in the development of this nation's present status as a world power.

Program Plan of Federal Agencies for Marine Sciences and Technology (In Millions)

Agency	FY 1966 Actual	FY 1967 Estimate	FY 1968 Estimate
Department of Defense -----	\$174.9	\$235.8	\$258.7
Department of the Interior -----	56.5	71.2	72.3
National Science Foundation -----	47.7 ¹	29.0	40.1
Department of Commerce -----	25.0	32.5	36.0
Department of Transportation ----	8.1	10.8	24.6
Atomic Energy Commission -----	8.3	13.7	15.8
Department of State -----	5.0	5.1	5.4
Department of Health, Education and Welfare -----	5.4	7.0	4.8
Agency for International Development -----	.1	2.0	2.0
Smithsonian Institution -----	1.5	1.6	1.8
National Aeronautics and Space Administration -----	.9	.4	.8
Total -----	\$333.4	\$409.1	\$462.3

¹ Includes Project Mohole which was discontinued in FY 1967.

Oceanography's Role in Defense

Rear Admiral O. D. Waters Jr., USN

The oceans that cover most of our globe have always been with us. In all probability life began there. So it is perhaps a little odd that in this latter day of multiplying marvels, there are few areas of scientific endeavor that have so whetted the imagination of men and the curiosity of scientists as the newly burgeoning field of oceanography.

Perhaps it is because almost every new discovery in the spreading realm of the ocean sciences has an almost immediately useful application, and many of them significantly affect our country's political, economic and military posture.

At the highest level, national welfare and national defense are inseparable but, in discussing the Defense Department's quarter-billion dollar oceanographic program, this article will confine itself to its military aspects. The fall-out benefits of this program to the nation's welfare are many, *e.g.*, increased food supplies, new drugs, improved recreation facilities, unlimited fresh water, better weather predictions, to name a few.

To the Navy, which is understandably DOD's executive agency in this area, oceanography embraces that body of science, technology, engineering and operations needed to exploit the oceans and their boundaries for our defense and related national objectives.

This mission involves many things. We explore and chart the oceans and coasts of the world. We examine not only the ocean floor but the sub-bottom as well. We examine the water itself for better knowledge of all the properties that affect our operations. (Sea water is not a simple fluid.) We study all phases of underwater sound propagation and the way it is affected by the air/sea and bottom/sea interfaces. We are deeply interested in marine biology for the way it affects sound propaga-

tion, and the way certain classes of marine life affect the performance of both our men and our equipment. We are trying to learn more about the variable interaction that takes place at the interface of ocean and atmosphere. We have a major interest in ice, its formation, and its movements. We are ceaselessly concerned with the ocean's dynamics, its tides, and its currents.

These and other environmental studies, too numerous to list here, are just a means to what we need to accomplish.

We are developing materials that resist fouling and corrosion. We are developing other materials capable of withstanding the enormous pressures of ocean depths—one of the more promising materials in this area is



RAdm. O. D. Waters Jr., USN, is the Oceanographer of the Navy with full responsibility for all the Navy's oceanographic programs, including basic and applied research, ocean engineering and fleet support. Before the consolidation of the Navy's oceanographic programs under one office, Adm. Waters served as Navy Oceanographer in the Office of the Chief of Naval Operations and as Commander, Naval Oceanographic Office, Suitland, Md.

glass. Mindful of the USS Thresher disaster, we are developing search and rescue vessels for distressed submarines and deep search vehicles to survey the ocean floor. We are developing new means of propulsion for these submarines, including a nuclear power plant for the forthcoming deep submergence research and ocean engineering vehicle, the NR-1.

At the same time we are developing equipment and techniques to extend man's ability to do useful work as a free diver right up to his physiological limits, which we think will extend to a thousand feet in the next few years. This diving effort is backed by a parallel program in underwater medicine.

To support all these efforts, we are developing, with the help of independent research and development on the part of U. S. industry, new instrumentation, data collection systems, and navigation systems. The geodetic satellite, which ties the world together, is a Navy program.

Additionally, we have traditional responsibilities concerned with safety at sea. These include the production and distribution of charts and various publications for the use of the Fleet and the merchant marine, and the issuance of a variety of ocean environmental forecasts and notices of hazards to navigation. We also carry out certain salvage operations, such as the recovery of the unarmed nuclear bomb off Palomares, Spain.

In support of these activities, there are 31 surface ships, one submarine and five aircraft assigned to the Navy's oceanographic program. Some of these ships are highly specialized, such as the Mizar which is reinforced for ice operations and has a center well for lowering massive equipments into the sea. In addition, a 3,000-ton catamaran research ship is being operated on a contract basis.

Not all of the ships in the oceanographic program are directly op-

erated by the Navy. Several are made available to major university laboratories where they are employed on Navy projects. Other ships, belonging to these laboratories, are utilized by the Navy and, on an opportunity basis, fleet, commercial and Coast Guard units are employed in oceanographic efforts.

Special platforms, such as Alvin, Flip (the ship that stands on end in the water), various towers and even an ice island are used. Submersibles and surface ships, developed and owned by industry, are leased as needed.

Oceanographer of the Navy Organization and Mission

To insure the effectiveness of the activities of the oceanographic program, and to avoid any duplication of effort, the Navy took steps just a little more than a year ago to streamline its entire oceanographic organization.

The Office of the Oceanographer of the Navy was established to direct the oceanographic program for the Chief of Naval Operations, with policy direction coming from the Secretary of the Navy. The Secretary's order gave the Oceanographer centralized authority, including control of the budget. From a budgetary standpoint, the Navy's oceanography program includes parts of 27 separate program elements, 70 budget line items, and seven Congressional appropriation categories. There are larger DOD programs which are concerned with only one element.

The organizational structure of the Office of the Oceanographer of the Navy (see page 16) separates the program into three main management areas:

- Science—under the Assistant Oceanographer for Ocean Science.
- Engineering—under the Assistant Oceanographer for Ocean Engineering and Development.
- Operations—under the Assistant Oceanographer for Ocean Operations.

The Assistant Oceanographer for Ocean Science is responsible for a broad scientific and technical program involving support of over 1,000 scientists and engineers at more than 100 academic and institutional facilities throughout the country, and within a dozen Navy laboratories. The program, totaling \$43 million in

FY 1968, provides a broad base of knowledge about the ocean environment upon which naval systems are developed and perfected.

The Assistant Oceanographer for Ocean Engineering and Development is responsible for activities which affect not only military capability but all activities under the sea. His efforts are designed to give the Navy a capability to operate at any depth, location and time within the ocean. Some of the projects included in this effort are:

- The Deep Submergence Systems Project concerned with the development of submarine escape, location and rescue; small object location and recovery; large object salvage; and increased diver working ability (Man-in-the-Sea). It also includes the efforts on the deep nuclear research submarine, the NR-1, and on the Trieste.

- The Deep Ocean Technology Project, an advanced development effort in ocean engineering and technology, covering such things as power sources, materials and structures, sensors, and sea floor engineering. The results of this development will have a major impact on all underwater work for whatever purpose. It is the area within DOD with perhaps

the greatest potential benefit to the nation's non-military needs.

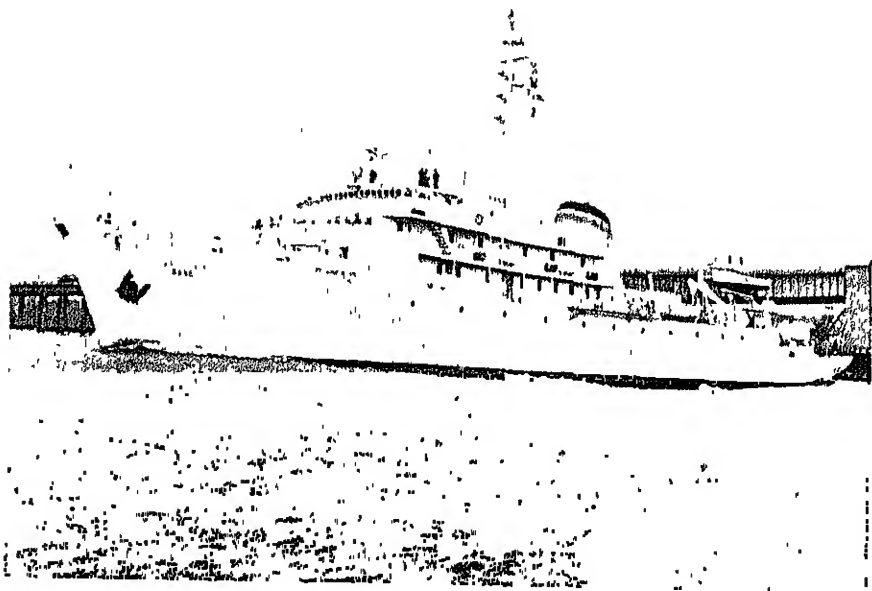
- A biomedical research effort of major proportions, lest the accomplishments in undersea technology outstrip man's ability to use them.

- A wide range of exploratory development programs in materials, power packages, and other engineering areas.

- An advanced development effort in support of marine environmental prediction.

The budget of the Ocean Engineering and Development component totals \$97 million for FY 1968. A major portion of this effort is performed under contract to industry. Over 20 Navy laboratories and medical facilities, however, play a major role both in exploratory development and in managing industrial efforts.

The Assistant Oceanographer for Oceanographic Operations is responsible for a great variety of oceanographic, geophysical and hydrographic surveys, conducted in all ocean areas to obtain critical environmental data. This component is responsible also for the production and dissemination of charts, publications, and environmental forecasts, necessary to support key naval operations including Vietnam. It also



The USNS Elisha Kane was built for oceanographic surveying and research. This ship is part of the Navy's growing oceanographic fleet under the direction of the Oceanographer of the Navy.

gives technical direction to the oceanographic support so necessary to many salvage operations.

The program of the Assistant Oceanographer for Oceanographic Operations totals \$109 million for FY 1968. It is concentrated at the Naval Oceanographic Office, and in the ocean environmental prediction sections of the Naval Weather Service Command.

The Role of Oceanography in Anti-Submarine Warfare

Oceanography is not to be confused with anti-submarine warfare (ASW), nor the Polaris system, nor amphibious or mine warfare operations. Oceanography is a necessary support element in all of the warfare areas, and it is also necessary to almost every waterborne weapon and surveillance system.

ASW is our primary object of support, for many of its systems are highly dependent upon the environment. As a minimum estimate, 50 percent of the oceanography program is directly applicable to the ASW area. Since much of this effort has multiple applications, ASW-oriented effort benefits other areas, and ASW is also frequently the indirect bene-

ficiary of projects oriented toward other requirements. As an example of this latter case, I refer again to the Deep Ocean Technology Project. Its objective is to establish a broad base of undersea technology in order to allow development of options for future weapon systems of all types. It is conceivable that, at some time in the future, an ASW barrier network could exist on the sea floor in waters three or four miles deep, and that its existence would be made possible by a series of breakthroughs in an apparently unrelated engineering area. In effect, oceanography supports seapower, and it is unrealistic to exclude activities in this program from any specific warfare area.

A great deal is already known about the environment's effect on ASW systems, and this knowledge serves as the basis for operational surveys and the products which are furnished the tactical commander. There is a great deal more to be learned, and an urgency for such knowledge. It must be remembered that there is a constant evolution of new weapon systems, each of which may require either different environmental knowledge, or such knowl-

edge to a different degree of accuracy or greater scope.

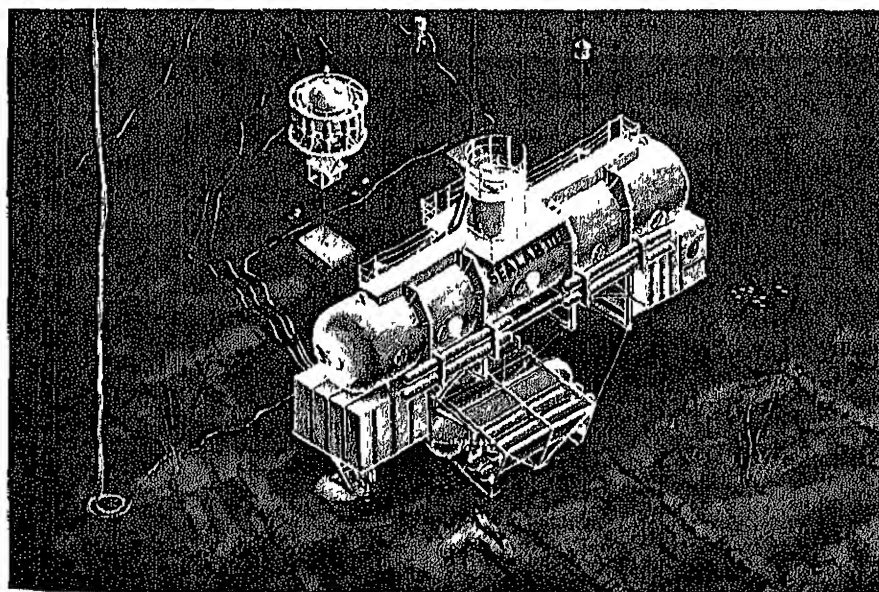
Underwater Acoustics

Underwater acoustics is the bread and butter of direct ASW oceanographic support. We are concerned with determining the influence of environmental factors upon sound propagation in the ocean. Our ultimate goal is to predict the performance of each of our sonar systems in all areas of the world. We investigate sound propagation, how it relates to the temperature and chemical structure of the water mass, and the masking of submarine echoes caused by reverberation from the bottom or from fish in the water. We also study the natural sounds of the sea which may mask our sound signals. In the early stages of this sonar work, it was recognized that the ocean bottom largely controlled the sonar's performance, and also that the sound transmission properties of the bottom varied greatly.

Fortunately, these variations can be directly correlated with the bottom sediments and topography. Our Marine Geophysical Survey Program is now sampling these properties throughout 16 million square miles of potential operating areas.

In many areas it can be predicted that the sonar will work very well. In a few very bad locations, it will not work reliably in the bottom bounce mode. Charts are being prepared indicating the exact type of performance which can be counted upon. The geology is the key to equipment performance in the bottom bounce mode. Highly reflective, smooth sediments enhance performance, while highly absorptive sediments attenuate the signal, and a very rough bottom causes excessive reverberation and masks submarine echoes. It is not just the bottom layer, but the several layers of the sub-bottom which may come into play, depending on the composition, grazing angle, frequency and other factors.

An attempt is being made to anticipate at least all near-term requirements for sonar and surveillance system support with environmental data by launching a comprehensive ASW, as well as undersea warfare survey program, which will collect data on the sea, the sea floor, and the sub-



Artist concept of the Navy's SEALAB III habitat. Up slope from the habitat is the device used as a pressurized elevator to ferry the aquanauts to and from the surface and ocean bottom.

bottom on a broad spectrum, and to the highest accuracy the state of the art permits. This information will serve not only to upgrade the performance of existing ASW systems, but will furnish guidance for future sonar and other system design and aid in the cost-effectiveness analysis of planned or proposed systems.

Ocean Environment Prediction

Besides the global survey of critical areas, we face the problem of prediction of time variable factors, such as layer depth, sea surface temperature, ice coverage, thermocline gradient, sea state, current boundaries, upwelling areas, and many others. For these predictions the tactical commander wants a tailored product, rather than a general purpose forecast from which he must extrapolate or refine the information.

The Naval Weather Service Command has in operation now a global network for the collection and processing of raw data and the dissemination of forecasts. The communications net is tied to a computer complex, and much of the procedure is automated. The products are even now quite useful and, considering the current sparsity of input data and the youth of the operational forecasting system, their potential value is tremendous. As part of the evolution of the system, there is now in an advanced state of development the Anti-Submarine Warfare Prediction Service (ASWEPS) for which data are collected on water temperature, sound velocity structure, surface wave actions and meteorological conditions. These are fed into the Naval Weather Sea Service Command systems on both coasts.

These scientific data are then converted into tactical guidance, such as probable sonar detection range, best depth for variable depth sonar, and optimum patterns for sonobuoys. The unique aspect of this service is that it provides an on-the-spot prediction of the ocean environment to predict it.

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stay in water favorable to him for 36 percent of the time, and unfavorable only 13 percent. In complex water areas, the ASWEPS system can improve sonar capability by a factor of two over a random track selection.

The temperature prediction charts, which come from the Navy's system, are also applicable to non-military work, and are being used by the Interior Department for use in fisheries prediction.

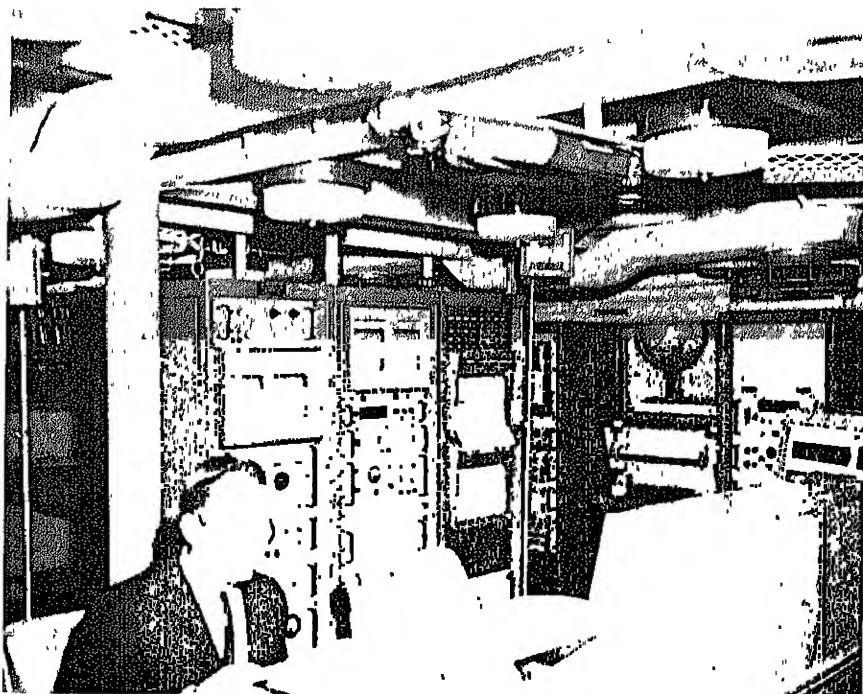
A major field program will commence next summer to study large scale sea surface temperature anomaly patterns as they generate and propagate across the North Pacific Ocean. Part of the instrumentation developed to support the program is the Monster Buoy. This 40-foot diameter buoy has been developed as a fixed-ocean data station. It is capable of measuring as many as 100 individual meteorological and oceanographic parameters, and transmitting the data over distances as great as 2,500 miles. Though developed to acquire scientific data for an ASW research effort, its development has been utilized by the Coast Guard by adaptation to allow its use as a replacement for lightships. Scotland lightship, off New York, is the first such replacement.

Other equipment, developed as part of the prediction efforts, includes the Shipborne Expendable Bathythermograph (BT), the first major advance since the BT was invented in World War II; automated sea-surface temperature devices; and an airborne infrared sea surface temperature sensing system. All of these have found or are finding their way into tactical ASW use. Other equipments, such as an airborne expendable BT, are now being developed.

One of the most successful prediction developments was the Optimum Ship Track Routing System, now used by over 800 ships/month in the Pacific alone. This system forecasts and weighs all the environmental conditions between the point of departure and the destination, and recommends the safest, fastest route.

Other ASW Support Efforts

Another area which must be considered in ASW is marine biology, for marine organisms not only foul sonar equipments but they reflect as false targets. In organic concentrations known as the deep scattering layer, present over much of the world, they mask submarine echoes. A deep submersible is being used to identify the organisms and study their



The Shipboard Survey System, onboard the USNS Silas Bent, digitizes, corrects, linearizes, arranges, displays and plots data from a large assortment of underway and on-station measuring devices.

acoustic characteristics. By learning more about the geographic and seasonal distributions of these layers, we hope to be able to better predict and avoid their influence upon the detection capabilities of fleet units.

Geophysics is another area of concern. Submarines on barrier patrol may utilize inertial navigators for precise navigation, and the effect of gravity anomalies can force serious errors into those equipments unless the anomaly value is known. The problem is most severe in the Pacific, where the bathymetry is more variable than in the Atlantic operating areas. In areas near deep ocean trenches, the variations can run as much as 600 milligals over a 100-mile line. These changes in gravity give rise to a deflection of the vertical as large as 60 seconds of arc, with resulting position errors of over a mile.

We are committed to gravity surveys at sea for several programs, and have several ships so assigned. In addition, much gravity data and many of the measuring techniques and equipment concepts come from the academic program. Magnetism is likewise of major interest, for local anomalies can act as false targets to Magnetic Anomaly Detection (MAD)

ASW systems. We are engaged not only in determining the anomalies, but in research to eliminate the background noise interference.

Other projects are being carried forward to develop various non-acoustic, environment sensitive means for the detection of both nuclear and non-nuclear submarines. The influence of internal waves on ASW is not yet well defined, nor are the waves themselves. The Arctic presents its own special problems to ASW, for obvious reasons, and we are looking at that area with increasing interest. The Navy, through the University of Alaska, has a major research laboratory on the shore of the polar sea at Point Barrow from which to launch its projects.

The oceanography program can have a long-term effect on ASW problems of a potential enemy. Every time we add 100 feet to the maximum operating depth of a submarine, we add millions of miles to its volume. The submersibles, being developed for research and survey of the deep ocean floor, will most certainly have some developments beneficial to combat submarine design and construction.

The ocean is our medium and the knowledge, which allows us to exploit it best, gives us an advantage

over an adversary not so well equipped. Oceanography, in its broadest sense, is the attainment of that knowledge.

There is no sector of our national life that has a bigger potential role to play in oceanography than has private industry.

The Defense Department has accepted national responsibility in the field of ocean technology, which I mentioned earlier, and we are turning, of necessity, to industry to develop and build the vehicles, the installations and the instruments that we must have for our expanding deep ocean operations. Many American firms are already at work in this area.

However, there are large opportunities outside of defense work and outside of the Government itself.

The oil industry has lead the way. Sixteen percent of the world's oil already comes from beneath the water. Federal revenues from oil, taken beyond the three-mile limit, exceeds the entire cost of the Defense Department's oceanographic program.

The Geneva Convention, signed in 1964, opens up other vistas. By this treaty we acquired exportation rights to the continental shelf out to the 200-meter line—in certain circumstances, beyond that. Thus, in one stroke, we acquired a territory larger than the Louisiana Purchase and, perhaps, more valuable.

Manganese, iron, titanium, zirconium, chromium, tungsten, sulphur, phosphate, magnesium and bromine—even gold and diamonds—are just some of the minerals and chemicals recoverable from the oceans as soon as growing shortages on the land make the operation profitable. In some cases, that time is now.

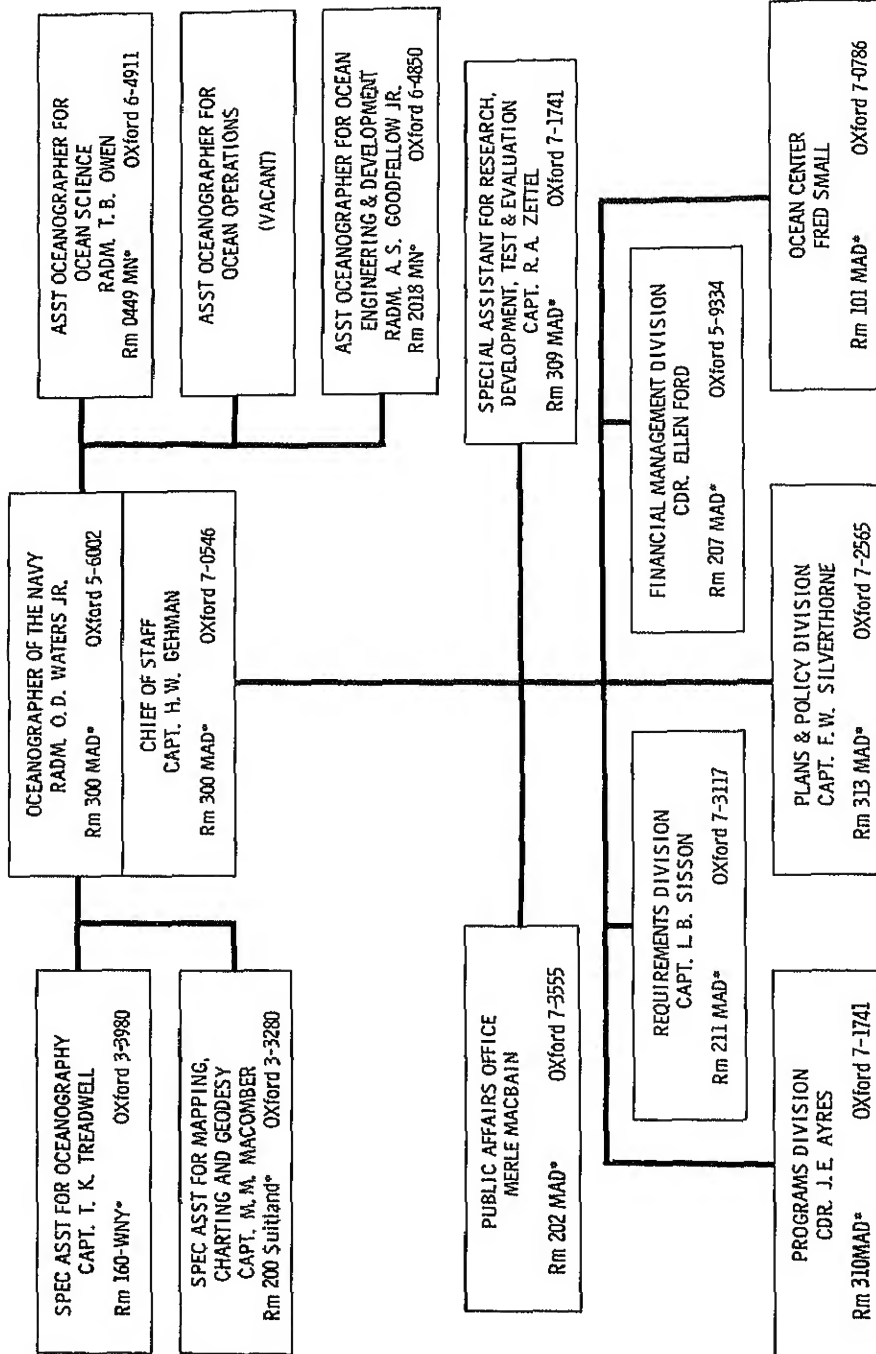
We know how to process fish meal concentrate for animal food and fertilizer, and this product, made from the so-called trash fish, has lately been refined to a point where it offers an inexpensive food source for protein-starved populations all over the world.

These are a few highlights, but enough I hope, to make it clear that Government and industry must make common cause to assure American leadership in the whole field of oceanography for the sake of our political and economical survival.



The importance of man living and working as a free agent in the ocean environment is increasing. Many oceanographic instruments must be installed and maintained by divers.

HEADQUARTERS OFFICE OF THE OCEANOGRAPHER OF THE NAVY 732 N. WASHINGTON STREET ALEXANDRIA, VA. 22314



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MN - Main Navy Building
18th & Constitution Ave. N.W.
Washington, D. C. 20360

SUITLAND - Navy Oceanographic Office
Suitland, Md. 20390

DECEMBER 1, 1967

Contemporary Principles of the International Law of the Sea

Lieutenant Commander Bruce A. Harlow, USN
Head, Law of the Sea Branch
International Law Division
Office of the Judge Advocate General of the Navy

[*Editor's Note: The following article is reprinted from the JAG Journal, published by the Office of the Judge Advocate General of the Navy. The objective of the JAG Journal is to acquaint naval personnel with matters related to the law and to bring to notice recent developments in this field. The views expressed in the articles must be considered as the views of the individual authors, not necessarily bearing the endorsement or approval of the Department of the Navy, the Judge Advocate General of the Navy, or any other agency or department of the Government.*]

It is not uncommon today to hear laymen—and surprisingly, even some lawyers—speak of the oceans as a no man's land where there is no law. As most would agree, nothing could be further from the truth. Indeed, the history of the law of the sea must be measured not in centuries but in millennia. Our modern law of the sea finds its roots in the famous Maritime Codes which are themselves as old as the great seafaring empires of Europe and the Near East. By a complex process of adoption, adaptation and, where necessary, invention, civilized men have always carried law with them whenever they ventured from their homeland.

As has been observed, the traditional law of the sea developed in response to a three-dimensional concept of seapower. Previously, seapower revolved around one central and overwhelmingly important use of the oceans—communications. For some nations, such as Great Britain, oceanic navigation was so vital as to become the central theme pervading their entire foreign policy for many centuries. Even today, the oceans represent the most important avenue

of trade and commerce for most nations. Right now—well over a half century since the advent of the airplane—99 percent of United States overseas trade moves by ship.

This dependence of many nations on seaborne communications resulted in the development of what could be termed a policy of "reciprocal restraints." This policy manifests itself in the much-used and abused legal doctrine of "Freedom of the Seas." Well after the principle of territorial sovereignty emerged as the dominant principle of jurisdictional organization on land, the maritime nations abandoned their attempts to extend this principle onto the vast oceans. Instead, three basic principles emerged with respect to the high seas:

(1) All nations have an equal right to use the high seas.

(2) One nation may not unreasonably interfere with the lawful use of the high seas by another.

(3) Each nation has jurisdiction over activities conducted on the high seas under its flag or nationality.

These basic principles were confirmed by the 1958 Convention on the High Seas, which explicitly states that its provisions are generally declaratory of established principles of international law.¹ At present, 38 states are parties to this Convention, including the United States, Great Britain, the Soviet Union, and many other maritime nations. Article 2 of the Convention provides:

The high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Freedom of the

high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises, *inter alia*, both for coastal and non-coastal States:

(1) Freedom of navigation;

(2) Freedom of fishing;

(3) Freedom to lay submarine cables and pipelines;

(4) Freedom to fly over the high seas.

These freedoms, and others which are recognized by the general principles of international law, shall be exercised by all States with reasonable regard to the interests of other States in their exercise of the freedom of the high seas.

The principle of freedom of the seas, as the text of the Convention reveals, could be more accurately called the freedom of the high seas, for it is only the high seas which are free. The term "high seas" is defined by the Convention to mean "all parts of the sea that are not included in the territorial sea or in the internal waters of a State."²

Internal waters are, in a legal sense, the exact opposite of the high seas. They are completely subject to the territorial sovereignty of the coastal state, which has as much control over them as it has over its land territory. All waters lying landward of the baseline from which the territorial sea is measured are internal waters.³ The baseline generally follows the low-water mark along the coast.⁴ In addition, a state may draw

¹ Convention on the High Seas, April 29, 1958, in force Sept. 30, 1962, 13 U.S.T. 2312, T.I.A.S. 5200, 460 U.N.T.S. 82 (hereinafter High Seas Convention), preamble.

² *Id.*, art. 1.

³ Convention on the Territorial Sea and the Contiguous Zone, April 29, 1958, in force Sept. 10, 1964, 16 U.S.T. 1606, T.I.A.S. 5639, 819 U.N.T.S. 205 (hereinafter Territorial Sea Convention), art. 5, par. 1.

⁴ *Id.*, art. 3.

its baseline along a straight line of any length across the mouth of a river which flows directly into the sea.⁵ Closing lines of unlimited length may also be drawn across the entrance to so-called historic bays; but across the entrance of other bays closing lines cannot exceed 24 miles.⁶ Finally, pursuant to the decision of the International Court of Justice in the *Anglo-Norwegian Fisheries Case*, under exceptional circumstances other sea areas closely linked to the land domain may be enclosed as internal waters by a system of "straight baselines" where the coast is deeply indented or where there is a fringe of islands laying immediately off the coast.⁷

The sovereignty of the coastal state extends also from this baseline to a narrow belt of sea adjacent to the coast called the "territorial sea."⁸ The Territorial Sea Convention explicitly states that the sovereignty of the coastal state extends to the airspace over the territorial sea as well as to its seabed and subsoil.⁹ The major legal difference between internal waters and the territorial sea is that ships of all nations have a right of innocent passage through the territorial sea, but generally not through internal waters.¹⁰ From the standpoint of control over the mineral and biological resources, there is essentially no difference between the two regimes, although the means employed by the coastal state to exploit these resources in the territorial sea, particularly when it comprises an international strait, cannot unreasonably obstruct established routes of international navigation.¹¹

The Territorial Sea Convention also authorizes a coastal state to establish a "contiguous zone" beyond its territorial sea in which it may exercise the control necessary to prevent

and punish infringement of its customs, fiscal, immigration or sanitary regulations within its territory or territorial sea. The contiguous zone is a high seas zone which cannot extend beyond 12 miles from the baseline from which the breadth of the territorial sea is measured.¹²

It is important to note that the contiguous zone referred to by the Territorial Sea Convention is not a zone in which the coastal state exercises special competence over mineral or biological resources. Nevertheless, over 30 states have claimed exclusive or primary jurisdiction over fisheries in zones contiguous to their territorial sea. Last year, the United States itself declared jurisdiction over the fish resources of a high seas zone extending 9 miles beyond the outer limit of the 3-mile territorial sea.¹³ The legality of these contiguous fisheries zones depends on customary law developed through the practice of states and not on any express provision of the 1958 Geneva Conventions.

It is significant that the classic rules of the international law of the sea did not give special attention to the seabed and subsoil of the oceans. It was generally assumed, however, that the established maritime zones extended down into the seabed and subsoil and up into the airspace. In fact, to the extent that this assumption conceded coastal state sovereignty over the seabed and subsoil beneath internal waters and the territorial sea,¹⁴ and conversely implied that all states have a right to lay submarine cables and pipelines on the seabed beneath the high seas,¹⁵ this assumption is today clearly established law.

Because of the inherent limitations of available technology, no great interest regarding the legal status of the seabed and subsoil under the high seas developed until recently. In the 19th century, England—herself the champion of freedom of the seas—did claim ownership of the pearl and chank fisheries under the high seas off the coasts of Ceylon and Bahrein

on the grounds of uninterrupted and undisputed proprietorship of successive rulers over these areas since time immemorial.¹⁶ But it was not until the middle of this century—not until the rich offshore oil deposits fell within the reach of an advanced technology—that any comprehensive attempt was made to establish the degree to which the principle of the freedom of the seas applied to the seabed and subsoil of the high seas.

The first move in this direction was the 1942 treaty between Great Britain and Venezuela concerning the seabed and subsoil of those portions of the Gulf of Paria which lay outside the territorial waters of either state.¹⁷ The Gulf of Paria is an almost completely enclosed body of water surrounded on one side by the Venezuelan coast and on the other by the Island of Trinidad. The treaty established lines dividing the seabed and subsoil of the Gulf between Trinidad and the Venezuelan coast.¹⁸ Each party agreed not to claim sovereignty or control in areas beyond that line and to recognize "any rights of sovereignty or control which have been or may hereafter be lawfully acquired" by the other party.¹⁹ The treaty explicitly states that it in no way affects the status of the waters of the Gulf or any right of navigation.²⁰ As important as the treaty is as a precedent in this field, it had specific application and did not purport to represent a policy of either state with regard to submarine areas generally. The announcement of such a comprehensive policy was to come a mere 3 years later from Great

⁵ *Id.*, art. 13.

⁶ *Id.*, art. 7.

⁷ *Fisheries Case* (United Kingdom v. Norway), [1951] I.C.J. Rep. 116; Territorial Sea Convention, *supra* note 3, art. 4.

⁸ Territorial Sea Convention, *supra* note 3, art. 1, par. 1.

⁹ *Id.*, art. 2.

¹⁰ *Id.*, art. 14, par. 1. There is a right of innocent passage through areas enclosed as internal waters by the establishment of a system of straight baselines if the areas were previously part of the territorial sea or the high seas. *Id.*, art. 6, par. 2.

¹¹ See *id.*, art. 15, par. 1; art. 16, par. 4; Corfu Channel Case (United Kingdom v. Albania), [1949] I.C.J. Rep. 4; see also Convention on the Continental Shelf, April 29, 1958, in force June 10, 1964, 16 U.S.T. 471, T.I.A.S. 5578, 499 U.N.T.S. 311 (hereinafter Continental Shelf Convention), art. 6, pars. 1 and 6.

¹² Territorial Sea Convention, *supra* note 3, art. 24.

¹³ 80 Stat. 908 (1966), 16 U.S.C. §§ 1091-94 (Supp. II, 1965-66).

¹⁴ See *supra*, note 9.

¹⁵ High Seas Convention, *supra* note 1, arts. 2 and 26; see Continental Shelf Convention, *supra* note 10, art. 4. This is the one enumerated freedom which, by its very nature, could not exist at all if the seabed and subsoil did not partake, at least to some degree, of the regime of the superjacent waters.

¹⁶ "Who can doubt that the pearl fisheries of Bahrein and Ceylon may be lawful objects of ownership?" *Vattel, Droit des gens*, bk 1, sec. 287. "The justification for this prohibition against chank fishing from banks which at their furthest extend as far as 25 miles from the Ceylonese coast, is based on rights over the fisheries enjoyed in uninterrupted and undisputed proprietorship by successive rulers, native, Portuguese, Dutch and British, since a period prior to the development of the doctrine of the 3-mile limit." Mr. Ormsby-Gore, Under Secretary of State for the Colonies, May 2, 1923, 163 H.C. Parliamentary Debates, cols. 1417-18 (5th ser.); 2 *Hackworth, Digest of International Law* 679 (1941).

¹⁷ Treaty Relating to the Submarine Areas of the Gulf of Paria, February 26, 1942, Brit. Treaty Ser., No. 10 (1942), Cmd. 6400; 1 *Laws and Regulations on the Regime of the High Seas* 44 (ST/LEG/SER.B/1) (U.N. Legislative Series, 1951). (Appendix A, *infra*.)

¹⁸ *Id.*, art. 3.

¹⁹ *Id.*, art. 2.

²⁰ *Id.*, art. 6. A similar statement was made by the British Under Secretary of State for Foreign Affairs on May 30, 1923 with respect to navigation and "ordinary" fishing rights on the high seas above the claimed pearl fisheries off Ceylon, 164 H.C. Parliamentary Debates, cols. 1261-62 (5th ser.); 2 *Hackworth, op. cit. supra* note 16, at 679.

Britain's successor as the world's leading maritime state.

On September 28, 1945, President Truman issued a proclamation which has already had the most significant impact on the development of the law of the sea of any single event in this century. On that date the President announced to the world that the United States regarded the natural resources of the subsoil and seabed of the continental shelf contiguous to its shores as being subject to its exclusive jurisdiction and control.²¹

By this proclamation, the resources of 750,000 square miles of underwater land were claimed by the United States—an area almost 3 times the size of Texas. The description of the claimed area contained in the press release accompanying the proclamation is significant because it not only indicates the magnitude of the area involved but also demonstrates that the claim was clearly limited to an area coextensive with the geologic continental shelf contiguous to the United States.²²

After the Truman Proclamation, several other nations followed suit and claimed exclusive ownership of the natural resources of their continental

shelves. The United States did not receive a single protest from any other state concerning the Truman Proclamation. Indeed, just 13 years later, the 1958 United Nations Conference on the Law of the Sea adopted the essential outlines of the United States proclamation and agreed, with surprisingly little debate in committee or at its plenary sessions, on the text of the Convention on the Continental Shelf.²³ As opposed to the Territorial Sea Convention and the High Seas Convention, which essentially codified long-established principles relating to well-known problems of communications and security, the Continental Shelf Convention laid the groundwork for a developing international law relating to the exploitation of seabed resources.

In order to discuss the Continental Shelf Convention, we must define the term "continental shelf." In simple geological terms, every continent is situated on a submarine base which extends seaward from the shore for a varying distance. This submerged extension of the land is called the "continental shelf." More specifically, it may be defined as the submerged portion of a continent *which slopes gently seaward from the low-water line to a point where a substantial break in grade occurs*, at which point the terrain slopes seaward at a steep grade until the great ocean depth is reached. The steep sloping area is called the "continental slope."

The continental shelf is a worldwide geological feature that is not peculiar to any one continent or any one hemisphere, although its distribution over the world is unequal. Along the coasts of the United States the width of the shelf varies from 1 nautical mile off parts of California to 250 miles off New England. In the Gulf of Mexico, near the Texas-Louisiana border, it has a width of 120 miles.

The continental shelf should not be confused with the waters overlying it—one is a land mass, under water, but land nevertheless; the other is a water area, sometimes called the "epicontinental sea." Keeping in mind

the geological concept of the continental shelf, let us now turn to its legal definition as contained in the Convention on the Continental Shelf.

Article 1 of the Convention defines the continental shelf as the seabed and subsoil of the high seas areas adjacent to the coast, to a depth of 200 meters or, *beyond that depth*, to where the depth of the superjacent water permits the exploitation of the natural resources of such areas.²⁴ The coastal state is granted sovereign rights for the purpose of exploring, and exploiting the natural resources of, the area so defined.²⁵ But the water and airspace above retain their character as free high seas and free airspace.²⁶ Thus, the provisions of the Convention concerning the rights of coastal states closely parallel those of the Truman Proclamation.

The "natural resources" of the continental shelf are defined as the mineral and other non-living resources of the seabed and subsoil, and living organisms belonging to the sedentary species that are attached to the seabed at the time of harvesting.²⁷ Thus, natural resources are defined in such a way as to include oyster beds and pearl fisheries but to exclude such crustaceans as shrimp. In the view of the United States, the definition includes the king crab, which can get off the bottom only by jumping.

The Convention authorizes a coastal nation to erect installations on its shelf to explore and exploit these resources.²⁸ The exercise of this authority, however, must not result in any "unjustifiable interference" with navigation, fishing, or conservation of living resources.²⁹ Safety zones necessary for the protection of the installations may be maintained, and may extend a maximum of 500 meters around an installation.³⁰ All ships must respect these zones. However,

²¹ Proclamation No. 2667, Policy of the United States with respect to the Natural Resources of the Subsoil and Seabed of the Continental Shelf, September 28, 1945, 59 Stat. 884, 10 Fed. Reg. 12303 (1945) (hereinafter the "Truman Proclamation"). (Appendix B, *infra*.) No explicit attempt to define what is meant by "natural resources" is evident. The question presents itself as to whether any living resources were included. A July 10, 1944, draft of the Proclamation stated that "rights under international law with respect to free swimming fish are in no way thus affected," implying a contrary intent with respect to sedentary species. 4 *Whiteman, Digest of International Law* 763 (1965). See *supra* note 20. The only reference in the Proclamation to specific resources is to "petroleum and other minerals." There is also a reference to a "pool or deposit" of resources. The question acquires an added dimension when it is considered that a companion proclamation concerning high seas fisheries was issued at the same time. Proclamation No. 2668, Policy of the United States with respect to Coastal Fisheries in Certain Areas of the High Seas, September 28, 1945, 59 Stat. 885, 10 Fed. Reg. 12304 (1945). Secretary Ickes distinguished the primary functions of the two proclamations when he said, "Approximately described, the Continental Shelf is all of the ocean floor around the United States and its Territories that is covered by no more than 600 feet of water. . . . Two Presidential proclamations assert our sovereignty over the mineral resources of this ground, and our jurisdiction over the fishery resources of the high seas contiguous to our lands." *Annual Report of the Secretary of the Interior, Fiscal Year Ended June 30, 1945*, p. 9 (1945); 4 *Whiteman op. cit. supra*, at 760 (emphasis added).

²² The press release stated that the Truman Proclamation would "make possible the orderly development of an underwater area 750,000 square miles in extent. Generally, submerged land which is contiguous to the continent and which is covered by no more than 100 fathoms (600 feet) of water is considered as the continental shelf." 13 *Dept. State Bull.* 484 (1945). See *supra* note 21.

²³ Continental Shelf Convention, *supra* note 10. (Appendix C, *infra*.) "The Continental Shelf doctrine is well established in international practice and all the substantive articles of the convention were adopted by large majorities." Acting Secretary of State Dillon to President Eisenhower, letter of Sept. 2, 1959, 4 *Whiteman, op. cit. supra* note 21, at 867.

²⁴ Continental Shelf Convention, *supra* note 10, art. 1: "For the purpose of these articles, the term 'continental shelf' is used as referring (a) to the seabed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 meters or, beyond that limit, to where the depth of the superjacent waters admits of the exploitation of the natural resources of the said areas, (b) to the seabed and subsoil of similar submarine areas adjacent to the coasts of islands."

²⁵ *Id.*, art. 2, par. 1.

²⁶ *Id.*, art. 3. The Truman Proclamation, *supra* note 21, contained a similar statement. See also *supra* note 20.

²⁷ Continental Shelf Convention, *supra* note 10, art. 2, par. 4.

²⁸ *Id.*, art. 5, par. 2.

(Continued on Page 34)



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Maj. Gen. George E. Pickett, USA, has assumed duties as Vice Dir., Defense Communications Agency (DCA). Gen. Pickett has been serving as Dep. Dir. for the Defense Communications System since his assignment to DCA in March 1965.

Dr. Louis M. Rousselot assumed the position of Dep. Asst. Secretary of Defense (Health and Medical) in the Office of the Asst. Secretary of Defense (Manpower) on Jan. 2, 1968.

Col. Edmund Czapski, USAF, has been assigned as Comptroller, Field Command, Defense Atomic Support Agency, Sandia Base, N. M.

New assignments in the Defense Supply Agency include: Col. Orville L. Smiley, USAF, Dir., Office of Data Systems, Defense Personnel Support Center, Philadelphia, Pa.; Col. Robert McCormack, USAF, Dir., Technical Operations, Defense Electronics Supply Center, Dayton, Ohio; Capt. Carl J. Strienger Jr., USN (SC), Commander, and Col. Carmon M. Anderson, USAF, Dep. Commander, Defense Depot, Mechanicsburg, Pa.; Col. Joseph J. Pounder Jr., USAF, Dep. Commander, Defense Depot, Tracy, Calif.; Col. William B. Cannon, USAF, Chief, Defense Contract Administration Services District, Garden City, N. Y.; and Col. Robert W. West, USAF, Chief, Defense Contract Administration Services District, Fort Holabird, Baltimore, Md.

DEPARTMENT OF THE ARMY

Brig. Gen. William A. Becker has been designated Dep. Commanding General, U. S. Army Combat Developments Command, Fort Belvoir, Va. He replaces Maj. Gen. Julian J. Ewell who has been assigned to duty in Vietnam.

Col. James C. Miller Jr. has been named Project Manager for the SAM-D (Surface-to-Air-Missile Development) at the U.S. Army Missile Command, Redstone Arsenal, Ala. He replaces Col. E. M. Dooley who has been assigned to the Sentinel System Project.

Leonard R. Ambrosini has been appointed Chief Systems Engineer for Hq., U. S. Army Weapons Command, Rock Island, Ill.

DEPARTMENT OF THE NAVY

The new Asst Commandant of the U.S. Marine Corps is Lt. Gen. Lewis W. Walt, USMC.

RAdm. Roger W. Paine Jr. has been assigned Dir., Naval Information Systems Div., in the Office of the Chief of Naval Operations.



Gen. Leonard F. Chapman Jr., USMC, has been sworn in as the 24th Commandant of the Marine Corps relieving Gen. Wallace M. Greene Jr., USMC, as commander of 300,000 U.S. Marines around the world. The new commandant was moved up from the post of Assistant Commandant and was promoted to four-star rank with the assignment. Gen. Chapman, 54, is a native of Key West, Fla. and is a 1935 graduate of the University of Florida. He has served in the Marine Corps for more than 32 years and, prior to being assigned as Assistant Commandant in July 1967, served as Chief of Staff, Headquarters, Marine Corps.

Brig. Gen. William G. Johnson, USMC, has replaced Brig. Gen. Alan J. Armstrong, USMC, as Asst. Dep. Chief of Staff (Air), Hq., U. S. Marine Corp. Gen. Armstrong has been assigned Dir., Marine Corps Landing Force Development Center, Marine Corps Schools, Quantico, Va.

Other new assignments in the Navy include: Capt. Stuart M. Ball, (SC), Commanding Officer, Naval Supply Center, Puget Sound, Bremerton, Wash.; Capt. Robert E. Barnhart, Commanding Officer, Pearl Harbor Naval Shipyard; and Capt. Jack N. Miller, Commanding Officer, Naval Training Device Center, Orlando, Fla.

DEPARTMENT OF THE AIR FORCE

Thomas H. Nielsen, formerly President of the California Land Co. and Executive Vice President of the White Investment Co., has assumed duties as Asst. Secretary of the Air Force (Financial Management). He replaces Leonard Marks Jr. who resigned at the end of 1967.

Lt. Gen. William W. Momyer, Dep. Commander, Military Assistance Command, Vietnam, for Air Operations, and Commander, Seventh Air Force, Pacific Air Forces, has been promoted to the rank of general.

Brig. Gen. James D. Kemp will become Dep. Commander, San Antonio Air Materiel Area, Kelly AFB, Tex., effective March 1, 1968.

Other assignments in the Air Force Systems Command are: Col. Leon S. Bogan, Chief, Procurement and Production Div., Space and Missile System Organization; Col. David J. Duff, System Program Dir., Integrated Air Base Defense System, Aeronautical Systems Div.; Col. David M. Falk, Chief, AGM-69A Program Office, Aeronautical Systems Div.; Col. James R. Finton, Dir., Avionics Subsystems Engineering, Aeronautical Systems Div.; and Col. Albert P. Lovelady, System Program Dir., Life Support Systems, Aeronautical Systems Div.



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1. "Operation Attleroro" by Gary Porter.
2. "A Patrol" by Edward Reep.
3. "Convent of Cherubusco" by James Walker.
5. "Medical Evacuation" by Sp4 Felix R. Sanchez.

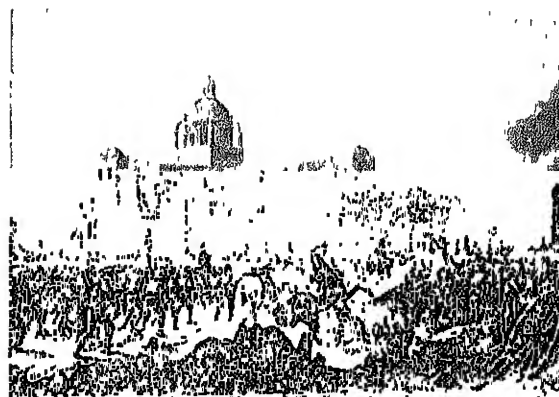
U.S. Army Historical Collection Available for Exhibition and Reproduction

The almost 12,000 paintings in the U.S. Army Historical Collection represent the efforts of combat artists who have observed actions since the time of the Mexican War. Although the collection primarily consists of oils, watercolors and drawings from World War II, a limited number of paintings depict American military history before and since that period.

Today, in Vietnam, artists are once again documenting the impressions and activities of the soldier in combat. Nearly 1,000 pieces of artwork, with a wide range of subjects, have been produced by artists associated with the Army's Combat Artist Program.

The paintings, examples of which are reproduced on this page, are the property of the Department of the Army and are available for exhibition and publication. All inquiries, concerning their availability, selection and use, should be directed to:

Chief of Military History
Department of the Army
Temporary C Building
2d and R Streets SW
Washington, D.C. 20315
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4

Deep Submergence Progress, Problems and Plans

Captain William M. Nicholson, USN

For more than 5,000 years man has used the oceans for food, for travel, for transport, for war and, especially during the past few years, for recreation. However, in these endeavors man has essentially been limited to the surface of the oceans, to the epidermis of the seas.

Man fishes from surface ships with nets and lines; he raises "seafood"—and comparatively little—in sheltered, shallow, coastal waters. His trading ships criss-cross the surface of the seas, and even his underwater ships, submarines, are limited to the near surface with a diving capability measured in hundreds of feet in an ocean which has a maximum depth of some 36,000 feet. Man is unable to effectively search for and recover small objects even in the relatively shallow waters, witness the three-month search and recovery effort for an H-bomb lost in 2,800 feet of water off Palomares, Spain, in early 1966.

During the past decade man has made greater strides in penetrating this "inner space" than he has in the previous 5,000 years. The U.S. Navy's part in this intensive effort to penetrate the ocean depths began on January 23, 1960, when the Navy bathyscaph Trieste, piloted by Lieutenant Don Walsh, USN, descended to a depth of 35,800 feet, the deepest known ocean depth.

The reasons for Navy interest and leadership in this field are many. The major advantages to be gained in exploiting the ocean depths are increased capabilities for underwater rescue, salvage, and construction; deep-sea search and recovery; anti-submarine operations; mine warfare; and amphibious warfare.

The Navy's main efforts in developing a deep submergence capability are directed by the Deep Submergence Systems Project (DSSP), one

of 12 designated project offices under the Chief of Naval Material.

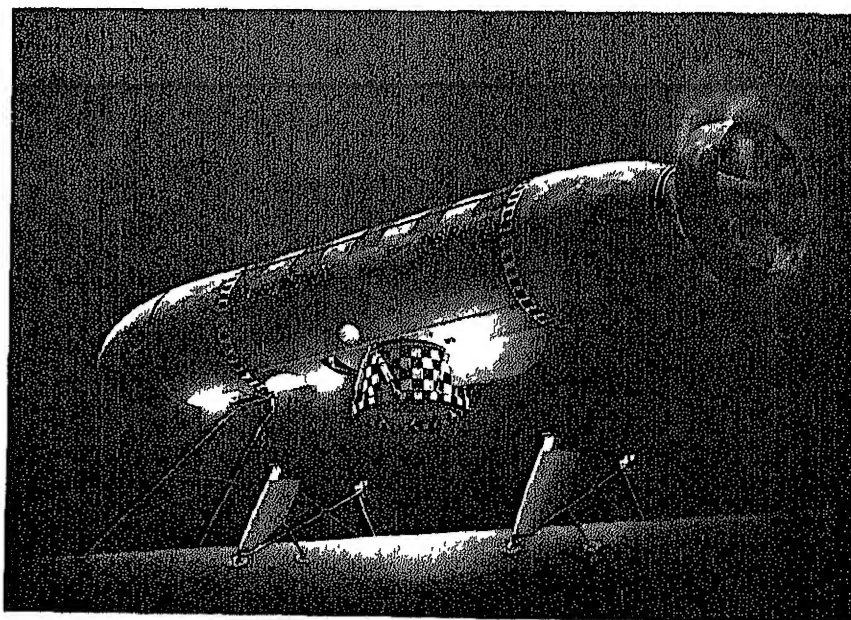
Submarine Rescue

The highest priority program within DSSP is the development of a system to rescue crewmen from a submarine disabled on the ocean floor above its collapse depth. The key element in this program is the Deep Submergence Rescue Vehicle (DSRV). These vehicles will be air transportable to provide rapid response to an undersea disaster anywhere in the world, capable of being transported "piggy-back" on submerged submarines for all-weather and under-ice operations, equipped with sophisticated sensors and propulsion equipment to locate and mate with disabled

submarines, and capable of transferring up to 24 survivors per trip from the disabled submarine to the supporting "mother" submarine.

The DSRV-1 is now under construction by Lockheed Missiles and Space Co. in Sunnyvale, Calif. This 49.5 foot, 30-ton vehicle will be completed in late 1968.

Upon completion, the DSRV-1 will be transported to San Diego, Calif., for sea trials and rescue system tests on the San Clemente Island Range. These trials and tests will be conducted initially by Lockheed personnel and then by Navy personnel. During the DSRV-1's approximately 10 months at the range, the vehicle will be tested to its maximum operational depth and will mate with a simulated



Artist concept of the first of the deep submergence rescue vehicles (DSRV) planned by the Navy. The DSRV is shown mating to the restraining guide wires and the piggy back berth on the mother submarine.

disabled submarine hull on the ocean floor.

In conjunction with these tests, the diesel-electric submarine Salmon is being modified to simulate a "mother" submarine for the DSRV-1. The DSRV-1 will "land" aboard the Salmon's main deck aft of the sail structure, be locked down, and transported by the submarine. During this mating operation the DSRV-1's crew will be able to pass freely between the Salmon and the DSRV while they are locked together.

The requirements to mate underwater with a disabled submarine and with a moving submarine present the most difficult and challenging problems faced in the DSRV program. Design performance requirements specify that the DSRV must be capable of effecting a mate, in the presence of a one-knot current, to the deck of the disabled submarine at any angle up to 45 degrees from the horizontal. This mating requirement was the most important factor governing design of the DSRV.

The first step in the mating sequence involves pinpointing the exact location of the escape hatch of the stricken submarine. Although it is assumed that the disabled submarine

location is known, the hatch itself may not be visible. The DSRV is equipped with several optical and sonar sensors, as well as several viewports, for this phase of the operation. If water visibility is good (50-100 feet or better), there should be little trouble in locating the hatch. If the water is "black," however, this step will be like groping in the dark, and sonic detection will be the only alternative.

The next two steps in the sequence—cutting the disabled submarine's buoy cable and "landing" on the hatch seat—require the DSRV to hover within a small area, in effect to operate as an underwater helicopter.

The DSRV propulsion and maneuvering system was designed to gain this capability. The DSRV's stern propeller and four ducted thrusters provide power in any of five degrees of freedom—pitch, yaw, surge, heave and sway. The sixth degree of freedom, that of roll, is controlled by a mercury trim-and-list system.

The flow field over the disabled submarine's hatch will probably not be uniform, even in a current of one knot. Hence, dynamic forces will be applied to the DSRV that may be

difficult or impossible to counter. Should the DSRV not be able to hover in a disturbed field, it will have the aid of a hauldown winch and anchor system. In this situation, the DSRV need hover over the submarine only long enough to attach anchors and a hauldown grapple hook to the submarine's hatch.

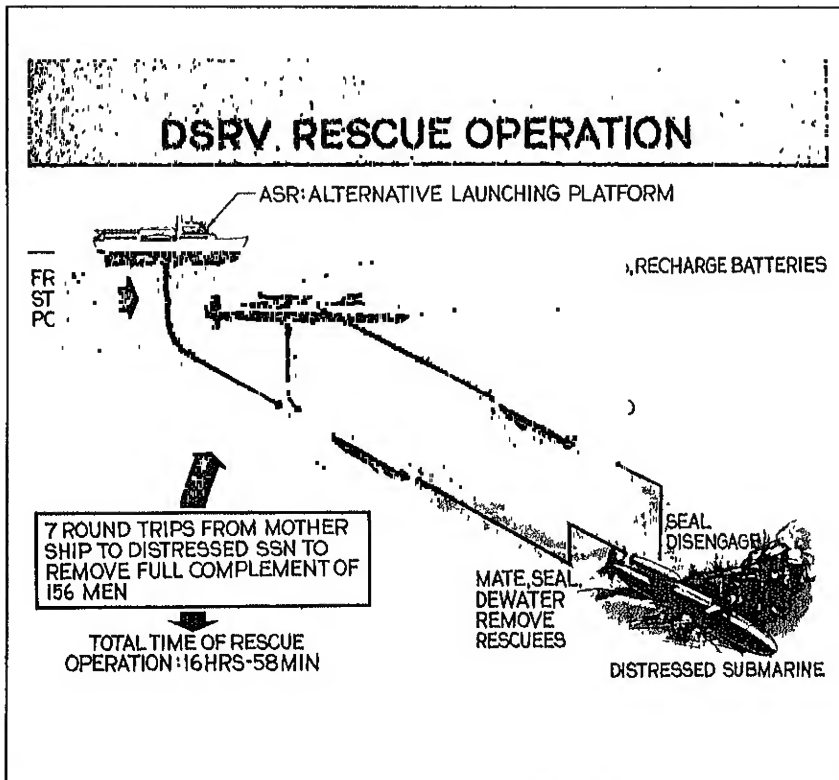
The next step in the mating sequence brings touchdown. To prevent excessive impact stresses or damage to the hatch seat, a hydraulic shock attenuation system has been provided. This system will permit impact velocities of up to two feet per second from any direction without damage to the DSRV. Upon touchdown, water will be forced out of the mating skirt to equalize internal pressures, if necessary, between the DSRV rescue spheres and the disabled submarine. The hatches can then be opened to transfer survivors.

The mating sequence for the DSRV is now being developed through the use of a Lighter-Than-Air Submarine Simulator (LASS). LASS uses a remote control airship resembling the DSRV. Because air and water are both fluids and vehicle movement is affected by the same dynamic forces, the airship can be used to simulate the vehicle.

The airship is approximately 50 feet long, weighs 170 pounds, and is neutrally buoyant. Propulsion is achieved by a conventional propeller aft encased in a movable ring stabilizer (similar to the DSRV main propulsion arrangement). The LASS "pilot" flies the airship by remote control, attempting to maneuver and mate the airship with a Quonset-hut structure which resembles a submarine hull and sail structure. Television cameras in the airship give the pilot a view of the "submarine," similar to that which the DSRV pilots will see during an actual mating operation with a disabled submarine.

The actual DSRV-1 vehicle is now being assembled at Sunnyvale, Calif. The vehicle's three pressure spheres will be mated with the fiberglass outer hull in April, with the entire vehicle to be fully assembled for sea trials in late 1968.

The contract for construction of the DSRV-2 was awarded to Lockheed Missiles and Space Company in November 1967. This vehicle is scheduled for completion in mid-1969.



Search

The DSSP Search Program will provide the capability of locating and recovering small objects on the ocean floor to depths of 20,000 feet. The Deep Submergence Search Vehicle (DSSV) is being developed as a part of this program. This vehicle will be capable of operating at greater depths than any other undersea vehicle, except for the U.S. bathyscaph Trieste and the French bathyscaph Archimède. However, the bathyscaphs are essentially underwater elevators with relatively little endurance (five and 12 hours, respectively), limited horizontal maneuverability, and rudimentary search equipment.

In contrast, the new Navy search vehicle will have a bottom endurance of 30 hours at three knots with a 50-percent reserve power supply. Maximum speed will be five knots. The search vehicle will also have a great degree of maneuverability. An elaborate sensor system, similar to that of the rescue vehicle, will enable the DSSV to pinpoint small objects on the ocean floor. The search vehicle itself will be equipped to recover small objects and assist other recovery devices in lifting larger objects.

The key problem areas in the design of the search vehicle are those of power and materials. Because of the power/endurance requirements for search missions, the DSSV may be the first deep submergence vehicle to employ fuel cells as its primary power source. Based on current technology, a silver-zinc battery for the search vehicle would weigh from 1,000 to 25,000 pounds and require volume of 200 to 230 cubic feet; the weight and space requirements for a comparable fuel cell power system are expected to be 9,000 to 11,000 pounds and 120 to 130 cubic feet. The Navy is issuing requests for proposal to five firms for the development of the DSSV fuel cell system (Allis Chalmers, Monsanto Research Corp., Union Carbide, Pratt and Whitney Aircraft, and General Electric). A contract to provide the system will be awarded to one of these firms in the fall of 1968.

The materials problems in the search vehicle program are essentially those of providing a vehicle which can withstand the tremendous

pressure at 20,000 feet (almost 9,000 pounds per square inch) with a 50-percent safety factor and still have a reasonable amount of buoyancy. (The vehicle need not be positively buoyant when operating for its propulsion can be used to return it to the surface. In an emergency, the vehicle could jettison certain equipment to increase buoyancy.)

The simplest method of obtaining pressure protection is to increase the thickness of the pressure hull walls. However, this tends to increase the weight of the vehicle. The U.S. and French bathyscaphs, which can penetrate inner space, have huge buoyancy tanks filled with hexane (45,000 gallons in the Archimède) or aviation gas (47,000 gallons in the Trieste II) which provide the required buoyancy. But these "floatation tanks" make the bathyscaphs large, unwieldy, and restrict maneuverability.

Thus the Navy's new search vehicle will combine advanced materials for the pressure hull (titanium or high-yield steel) with high-buoyancy materials, such as syntactic foam, to provide a safe, yet highly maneuverable vehicle of reasonable size.

Like the rescue vehicle, the dimensions of the search vehicle are constrained by the requirement that it, too, like the rescue vehicle, be transported "piggy-back" aboard nuclear-powered "mother" submarines. However, air transportation will be a consideration and not a requirement.

Current planning calls for the following search vehicle characteristics: 70,000 pounds weight out of water, 50-foot length, 11-foot diameter, and a crew of two operators and two relief operators.

Lockheed Missiles and Space Co. and Westinghouse Electric Corp. are preparing parallel search vehicle design studies. One of these firms will be selected in mid-1968 to construct the vehicle with a contract go-ahead scheduled for fall of 1968. The DSSV-1 is scheduled to be completed in late 1971 and, after tests and trials, will be available for fleet use in 1972.

Long-range planning provides for the construction of four search vehicles. Two will be assigned to a search and recovery unit in the Atlantic and two to a similar unit in the Pacific. These units will each contain search vehicles, various sensor

platforms, recovery devices, a "mother" submarine, and a surface support ship.

Man-in-the-Sea

The Navy's Man-in-the-Sea Program is providing the technology and equipment required for permitting divers to live and work on the ocean floor for extended periods of time. The technology being used to provide this capability is "saturation diving."

Employing current diving technology, divers operating from surface ships have an underwater endurance of about 30 minutes at 300 feet. However, in returning to the surface they require three hours of decompression, meaning a bottom time-to-decompression ratio of 1:6. Saturation diving seeks to reduce this unfavorable ratio. Briefly, the diver is provided with a seafloor habitat pressurized to the outside water pressure, and he is provided a suitable breathing gas. This enables him to live in the dry habitat and work in the surrounding water without passing through intermediate locks or requiring decompression until he returns to the surface, after weeks or months of useful work. At that time decompression becomes dependent on depth rather than duration of the dive. Thus, after a week or a month or even a year, at a depth of 400 feet, the saturated diver will require a standard decompression of about three days.

The U.S. Navy open-sea experiments in saturation diving are known as SEALABs (Sea Laboratories), and the divers taking part in these operations are designated aquanauts.

The forthcoming SEALAB III experiment will be man's most ambitious effort to live and work on the ocean floor. During SEALAB III Navy men and civilian scientists will live in a seafloor habitat and work in the surrounding water for 60 days, carrying out tasks in the area of oceanography research, underwater construction, salvage, biological studies, and human performance and equipment evaluations.

This work operation will greatly advance man's capability to explore and exploit the ocean floor. SEALAB III—the Navy's open-sea experiment in saturation diving—will have five teams of eight men, each living in a 57-foot by 12-foot undersea labora-

tory for 12-day periods. Their habitat will be placed at a depth of 450 feet, off San Clemente Island, for the first three teams. Depending upon data from early phases of the experiment, the third team may move the habitat to a depth of 600 feet for use by the last two teams.

The habitat itself is being refurbished at the San Francisco Bay Naval Shipyard (where it was built for use in SEALAB II, a 45-day, 205-foot experiment conducted in 1965).

Other key hardware components of SEALAB III include the surface support ship, which was converted for range undersea support operations at the Avondale Shipyards and is being outfitted at the San Francisco Bay Naval Shipyard; the diver support equipment, which is being developed and fabricated by a number of Navy activities and commercial firms; and the aquanauts themselves, who are being trained at the Deep Submergence Systems Project Technical Office in San Diego, the Navy Underwater Swimmers School, Key West, Fla., and the Navy Experimental Diving Unit, Washington, D.C.

SEALAB III is now scheduled to begin in the late summer or early fall of 1968.

Large Object Salvage System

Much of the technology and equipment being developed in the Navy's Man-in-the-Sea Program will be employed in the Large Object Salvage System (LOSS). This program will provide the Navy with the capability of lifting a sunken submarine from a depth of 850 feet (the approximate depth limit of the continental shelf, the gently sloping off-shore extension of land masses).

In LOSS, pontoons and lift-control barges will be employed to lift a submarine or other large object to the surface. Divers will be required to perform a number of tasks in a deep-sea salvage operation, among them such key jobs as attaching the lifting cables to the hulk.

The other major component of LOSS is the salvage operational control ship which will contain computer and display equipment to aid the salvage master in problem areas, such as general communications, initial mooring design, calculating the breakout force necessary to free the

submarine from bottom suction, buoyancy predictions, lift distribution, etc. Oceanographic and meteorological sensor and evaluation equipment, vital to salvage operations, will also be included in the ship.

The overall LOSS program has been delayed because of budgetary cuts. The SEALAB III experiment, which will begin later this year, will test out the diving system and related work equipment, such as diver tools which will become part of an operational salvage system. The Naval Civil Engineering Laboratory at Port Hueneme, Calif., is conducting studies into breakout force requirements for different ocean-floor areas; the Naval Undersea Warfare Center at Pasadena, Calif., is studying a wreck coordinate system which will assist a diver in navigating between his seafloor habitat and work area; and the Naval Ordnance Laboratory at White Oak, Md., is working on a padeye attachment which can be used in lifting hulks from the ocean floor.

Although lack of funding makes LOSS scheduling uncertain, it is expected that two LOSS units will be operational by the mid-1970s.

NR-1

Included in the DSSP program is a nuclear propelled deep submergence



Capt. William M. Nicholson, USN, has been Project Manager of the Navy's Deep Submergence Systems Project since Jan. 1967. Prior to this assignment, he served as Head of the Ship Systems Engineering Department, Naval Ship Engineering Center, and before that held various assignments in naval engineering, ship design and engineering management.

research vehicle, the NR-1. Security classification precludes any discussion on this project in this article.

The various programs of the Navy's Deep Submergence Systems Project will provide the nation with an invaluable capability to exploit the ocean depths for military and economic operations. The spin-off from the programs are already being felt in non-military areas. Saturation diving, a concept developed by the U.S. Navy and proven in laboratory tests, has been widely adopted for use in underwater oil drilling and similar activities. There is today a definite requirement for saturation diving in Southeast Asia.

President Johnson has observed: "Much of our natural bounty consists of water . . . the oceans of the world hold great promise to provide future generations with minerals, food, energy, and fresh water. We must turn our attention to finding more appropriate ways and better means of transforming this promise into achievement."

The Navy's Deep Submergence Systems Project is today helping to turn this promise into achievement—in our time.

Army Forms Engineer Division To Handle Sentinel Construction

The Army has organized a new Engineer Division at Huntsville, Ala., to direct the design and construction of the Sentinel anti-ballistic missile system.

The new division is temporarily headquartered in Alexandria, Va., but is destined to be permanently located at Huntsville, adjacent to the Sentinel System Command at Redstone Arsenal which is responsible for development of the ABM system.

Brigadier General Robert P. Young, former head of the Army Engineer Command, Europe, is the new division engineer. Colonel George A. Rebh, Tulsa District Engineer, has been named Deputy Division Engineer.

As construction proceeds, an area engineer will be appointed at each Sentinel site to manage construction.

Security Classification Guidance for Defense Industry

George MacClain

Comprehensive, accurate and understandable security classification guidance for defense contractors and subcontractors, who work with classified information, is indispensable if the Industrial Security Program of the Defense Department is to be used and administered in an effective and economical manner.

The familiar instrument for providing security classification guidance to industry is the DD Form 254. This instrument has been in use for many years and is revised from time to time. The last major revision occurred in 1960, at which time the principal objective was to emphasize the importance of classifying information, rather than classifying the document, hardware, or other material in which the information was contained. That concept applies today, not only with respect to the DD Form 254 but with respect to all security classification and security classification guidance.

Despite the 1960 improvement, a number of adverse criticisms to the DD Form 254 were made. The chief complaints were that the DD Form 254 did not sufficiently provide specific classification guidance, and that the check list items were too broad and not sufficiently inclusive to be equally well suited to the many kinds of classified contractual work. There were also other complaints relating, for example, to the procedures for issuance and to the maintenance of current accuracy in the guidance provided.

Beginning in 1965, a determined effort was instituted in the Directorate for Classification Management,¹ Office of the Assistant Secretary of Defense (Administration), to identify the serious problems and to discover ways and means to bring about

¹Now designated Security Classification Management Division, Directorate for Security Policy.

needed and desirable improvements, not only in the DD Form 254 but also in the associated policies and procedures. In this connection, the views of industry were solicited and many very helpful views were received.

Additionally, proposals were put together within DOD, and were considered and commented upon by the various DOD components whose operations include procurement activities in industry.

In August 1967, the Assistant Secretary of Defense (Administration) approved a new and improved plan for providing security classification guidance to industry. Briefly, this plan encompasses continued use of

the DD Form 254, but the form has been redesignated "Contract Security Classification Specification," and has been revised in both content and form. The policies and procedures for the preparation and use of this form have been revised. A new DD Form 254c has been established to serve as a continuation sheet for the DD Form 254.

The whole plan will become effective, so far as industry is concerned, upon the completion of the revision of those parts of the DOD Industrial Security Regulation (DOD 5220.22-R) and the DOD Industrial Security Manual (DOD 5220.22-M) which must be revised in order to implement this new plan. This revision is expected to be published early in 1968.

The total plan, as approved by the Assistant Secretary of Defense (Administration), has been disseminated within DOD and to those agencies of the Government outside of DOD which, pursuant to mutual agreement, use the DOD Industrial Security Program. Because of this advanced dissemination, the User Agencies, both within and outside of DOD, will be ready to go into operation under the new plan promptly upon its issuance for use by industry.



George MacClain is the Dir., Security Classification Management Div., Directorate for Security Policy, in the Office of the Asst. Secretary of Defense (Administration). He has held this position since 1963. From March 1955 until March 1963, he served as Legal Advisor and Special Asst. to the Dir., Office of Industrial Personnel Access Authorization (Security Review), in the Office of the Asst. Secretary of Defense (Manpower).

During the period in which the new plan has been developed, frequent opportunities have been utilized to emphasize to the members of the defense industrial community, who will be involved, that it is hoped and intended that the new plan will motivate and facilitate the desired environment of mutual cooperation, mutual helpfulness, and mutual understanding among the User Agencies, the Office of Industrial Security of the Defense Contract Administration Services, and defense contractors

and subcontractors. In this connection, it is desirable to quote a few passages from the newly adopted policies and procedures. These quotations follow:

"Security classification guidance for contractors in industry is continuously and at all times the responsibility of Program/Project/Systems Managers, or equivalent officials. . . . their respective successors in interest, and their respective higher level supervisors and commanders in the same channel or chain of command."

"The completed contract security classification specification (DD Form 254), including DD Form 254c, attachments and supplements, is the basic document for conveying to the contractor classification, regrading and declassification specifications for a classified contract or subcontract. *It is designed to indicate, by a combination of a 'check list' and narrative comment, the classified areas of information involved in the contract or subcontract and, particularly, to identify the specific items of information within those areas which require security classification protection.*" (Italics added)

"In order to increase the effectiveness of guidance furnished and provide advance notice of pending possible classification requirements, . . . responsible officials [within the User Agency] should endeavor, by arrangements which are reasonable and fair to all concerned, to offer to contractors and potential contractors which have the necessary facility clearances, opportunity to participate in the preparation of the security classification specification."

The revised DD Form 254, and the new DD Form 254c are shown in the illustrations on pages 29 and 30.

From these illustrations, it will be seen that the DD Form 254 and the DD Form 254c each consist of a single sheet, front and back. A comparison of Item 13 of the 254 with 254c shows the interrelationship between the two forms. Item 13 of the 254 must be completed in every case. In some cases, the necessary check list and narrative security classification comment can be provided in the space available in Item 13. If not, the 254c or, as explained below, an authorized

substitute for the 254c must be cross referenced in Item 13 and, when completed, must be attached to the 254. Item 13 of the 254 also permits the listing of other documents as attachments to the 254, in the event that such other documents are needed to provide complete security classification guidance.

It is important to note that, although the 254c is available and may be used, the User Agency may substitute a different document of its own authorship in lieu of the 254c. Any such substitute document, however, will not be authorized for use unless, within its own form and content, it provides all of the classification guidance that must be provided by the 254c. Thus Item 13 of the 254, the 254c, and any substitute for the 254c, collectively, must always provide both a check list or index of items, and an appropriate narrative statement of classification guidance covering each applicable item listed.

When the new plan is made effective within industry, the existing 254, the "closeout 254," and the "Letter in Lieu of" will be discontinued. The "revised" and "final" 254 will be continued, but the policies and procedures for their use have been changed through clarification and simplifications which will be covered later in this article.

Special attention is invited to Items 2, 3, 6a, 7a, and 8 on the front side of the 254 illustrated. The proper use of these items will, in every instance, accurately identify the precise purpose and addressee of the particular 254—the prime contractor, the first tier subcontractor, and the relationship to one another of the successive tiers of subcontractors, after the first tier down to and including the tier for which the particular 254 is being issued. In every case, even where the 254 is being issued to a subcontractor of the first or any other tier, the prime contract and contractor will be identified in Items 3a and 6a. In every case of a 254 issued for a subcontractor, regardless of tier, the first tier subcontract and subcontractor will be identified in Items 3b and 7a. The identity of subcontracts and subcontractors after the first tier will be shown in Item 8. For example, if the particular 254

is to be issued to a fourth tier subcontractor, Item 8 will include a listing in the proper order of succession, beginning with the second tier, of the second, third and fourth tier subcontracts and subcontractors.

It is important to note how the 254 will relate to Invitations for Bid, Requests for Proposal, Requests for Quote, or any other form of solicitation of proposal. Items 2c, 3a, 3b, 3c, 6a, 7a, and 8 are involved in this connection. For example, if the 254 is being issued to accompany an Invitation for Bid (IFB) for a proposed prime contract, Item 2c will be checked; Item 3c will contain an identifying description of the IFB; and Item 6a will contain the name and address of the potential prime contractor's facility to which the 254 is to be sent. If the 254 is being issued to accompany an IFB for a proposed first tier subcontract, Item 2c will be checked; Items 3c and 6a will identify the prime contract and contractor; Item 3c will contain an identifying description of the IFB; and Item 7a will contain the name and address of the potential first tier subcontractor's facility to which the 254 is to be sent.

Earlier herein it was stated that the policies and procedures for issuance of the 254 have been revised and that the "closeout" 254 and "Letter in Lieu of" will be discontinued. An original 254 will be issued with each Request for Proposal (RFP), Request for Quote (RFQ), Invitation for Bid (IFB), or other solicitation, and with an award of a contract or follow-on contract. A new 254 is not required for a follow-on contract when the procurement is of a recurring nature, or when the end item is not changed and there is no change from the security classification requirements applicable to the preceding contract. However, a copy of the currently valid 254 for the preceding contract will be furnished and distributed with the follow-on contract, and will be annotated to show the contract number of the follow-on contract.

A final 254 will be issued upon final delivery of goods or services or upon termination of contract but only if at that time:

- Authority is granted to retain classified material over which the User Agency has classification jurisdiction and responsibility, i.e., classified material originated by the User Agency or generated by the contractor in the performance of the contract.

- All classified material, for which retention authority otherwise would be required, is ordered immediately declassified.

A revised 254 will be issued when, at any time subsequent to the issuance of the original 254, additional guidance in connection therewith is required to be disseminated, or, at the time of any review of an outstanding original or final 254, the then outstanding guidance is changed.

The new plan spells out certain typical situations and sets forth specific policies and procedures for each. For example, a 254 will not be required when classified procurement is limited to graphic art reproduction and the classification markings appear on the finished material which is to be reproduced. As another example, a guard service contract or alternate storage service contract will require a 254 to describe, in Item 13, the highest level or various levels of classification of information with respect to which the service must be performed, even though no additional breakdown of contract elements by classification is needed. It is believed that, in these and the other typical situations which are covered, the policies and procedures to be followed will simplify and reduce the burden of the 254.

A very important distinction has been introduced in the new plan. This distinction recognizes that the classified documentary material in the custody of the contractor can be separated into two distinct categories. One category is called "reference material." Reference material is defined as that classified documentary material over which the User Agency does not have classification jurisdiction, and did not have classification jurisdiction at the time such material was originated. Much material made available to contractors by the Defense Documentation Center (DDC) and other secondary distribution agencies is reference material as de-

fined herein. The other category, of course, is all other classified documentary material furnished to the contractor or generated by the contractor in the course of contract performance.

Recognition of the separate status of reference material, previously described, leads to significant results. First and foremost, the User Agency will not be regarded as having any classification guidance jurisdiction or responsibility with respect to such material. Secondly, in the case of a contract the performance of which is expected to require access only to reference material, an original 254 will be issued but only for limited purposes. First it will be issued to describe, in Item 13, the highest level or various levels of classification of reference material, to which access is expected to be required; second, to provide, in Item 13, any other security instructions which may be appropriate, such as the protection of classified information extracted from such material. Thirdly, a final 254 will not be issued in connection with granting retention authority, if all of the classified material authorized to be retained is reference material. Fourthly, the User Agency will not be required to review a 254, when the contract involved is classified solely because the contractor is permitted to have access to reference material.

It is essential, of course, that the security classification guidance provided by a 254 be kept current. To this end, the User Agency must systematically review and, as necessary, revise the 254. Under the new plan, as just indicated, this review requirement will not apply with respect to reference material. With respect to all other classified material, however, the review requirement will apply. Thus, during contract performance, review will be required at each change of phase or more frequently if directed to be done, and in any event at least once annually. Also, review will be required at the time of final delivery of goods or services, or upon termination of the contract if at that time a final 254 is required to be issued. As stated earlier herein, a final 254 will be required only if authority is granted to retain classified material over which the User Agency has classification jurisdiction

and responsibility, or all of that material is ordered immediately declassified. A final 254 is not required when the authority to retain is confined exclusively to reference material. Lastly, when a final 254 has been issued in connection with granting retention authority, that 254 itself must be reviewed at the conclusion of the retention period if at that time an extension of the retention authority is granted, or if at that time all material for which retention authority would be required is ordered immediately declassified.

As indicated, the User Agency has no classification guidance responsibility for reference material. However, a procedure is provided to enable a contractor to obtain current classification guidance with respect to such material. Consonant with basic classification management policy, classification guidance responsibility for reference material continuously remains with the DOD component which had classification jurisdiction over the material at the time it was prepared, or with the current successor in interest to that component. If a contractor desires classification guidance for reference material and cannot identify the responsible component, he is entitled to seek assistance in making such identification by submitting direct inquiry, in successive order, to the secondary distribution source from which the material was received, the User Agency contracting office last involved with the contractor concerning the subject matter of the material, and the Security Classification Management Division, Directorate for Security Policy, Office of the Assistant Secretary of Defense (Administration). In addition, of course, the contractor always has available to him the guidance, the authority and the procedures of the automatic, time-phased downgrading and declassification system.

The User Agency, in addition to being responsible for systematic review of classification guidance for classified material within its classification jurisdiction, also is responsible for "need-to-know" review in relation to acting upon a contractor's request for authority to retain classified material. This particular need-to-

DD Form 254 Contract Security Classification Specification

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REQUIREMENT OF DEFENSE CONTRACT SECURITY CLASSIFICATION SPECIFICATION (Complete classified items by separate correspondence)		1. THE REQUIREMENTS OF THE DOD INDUSTRIAL SECURITY MANUAL APPLY TO PERFORMANCE OF THIS CONTRACT. THE CONTRACTOR SHALL MAINTAIN THE CONTRACT PERFORMANCE OR FOR ACCESS TO CLASSIFIED INFORMATION IS	
2. THIS SPECIFICATION IS FOR:	3. CONTRACT NUMBER OR OTHER IDENTIFICATION NUMBER (If none, leave blank)	4. DATE TO BE COMPLETED (If none, leave blank)	5. THIS SPECIFICATION IS (See item 1a)
a. PRIME CONTRACT	b. PRIME CONTRACT	c. PRIME CONTRACT	d. ORIGINAL
e. FIRST TIER SUBCONTRACT	f. FIRST TIER SUBCONTRACT	g. REVISED (Include all previous correspondence)	h. FINAL
i. INVITATION TO BID OR REQUEST FOR PROPOSAL	j. INVITATION TO BID OR REQUEST FOR PROPOSAL	k. REQUEST FOR QUOTE	l. DOES NOT APPLY
3. IF THIS IS A FOLLOW-ON CONTRACT, ENTER PRECEDING CONTRACT NUMBER AND DATE COMPLETED. DATE COMPLETED			
6. NAME AND ADDRESS OF PRIME CONTRACTOR (Include ZIP Code)		7. NAME AND ADDRESS OF COORDINATE SECURITY OFFICE (Include ZIP Code)	
8. NAME AND ADDRESS OF FIRST TIER SUBCONTRACTOR (If applicable)		9. NAME AND ADDRESS OF COORDINATE SECURITY OFFICE (Include ZIP Code)	
10. SUBCONTRACTING BEYOND FIRST TIER (See instructions)			
11. GENERAL IDENTIFICATION OF THE REQUIREMENT FOR WHICH THIS SPECIFICATION APPLIES			
12. CONTRACT PRESCRIBES SECURITY REQUIREMENTS WHICH ARE ADDITIONAL TO THOSE PRESCRIBED IN DD FORM 441 AND THE 441 YES <input type="checkbox"/> NO <input type="checkbox"/>			
13. CONTRACT PERFORMANCE WILL REQUIRE			
GRAPHIC ARTS SERVICES			
ACCESS TO CONTROLLED AREA OR CLASSIFIED INFORMATION			
MANUFACTURE OF CLASSIFIED HARDWARE			
GENERATION, RECEIPT, OR CUSTODY OF CLASSIFIED DOCUMENTS OR OTHER MATERIAL			
ACCESS TO RESTRICTED DATA			
ACCESS TO CRYPTOGRAPHIC INFORMATION			
ACCESS TO COMMUNICATION ANALYSIS INFORMATION			
DEFENSE DOCUMENTATION CENTER OR DEFENSE INFORMATION ANALYSIS CENTER SERVICES MAY BE REQUIRED OF PM, AND			
14. REFER ALL QUESTIONS PERTAINING TO CONTRACT SECURITY CLASSIFICATION REQUIREMENTS TO THE OFFICIAL NAMED BELOW (INCLUDE ZIP CODE)			
a. PROGRAM/PROJECT NUMBER OR ACTIVITY (Name, Title, and Organization)		b. ADDRESS, TELEPHONE NUMBER AND OFFICE SYMBOL (Include ZIP Code)	
15. CONTRACT SECURITY CLASSIFICATION SPECIFICATION AND ATTACHMENTS REFERENCED HEREIN APPROVED BY THE USER AND THE CONTRACTING OFFICER ON HIS REPRESENTATIVE NAMED BELOW			
16. PRIME CONTRACTOR (Item 6a)		17. COORDINATE SECURITY OFFICE (Item 6b)	
18. ADMINISTRATIVE CONTRACTING OFFICE (Item 14b)		19. MATERIAL INSPECTOR	
20. ACTING FEDERAL BUREAU OF INVESTIGATION (Include ZIP Code)		21. SUBCONTRACTOR (Item 7a)	
22. COORDINATE SECURITY OFFICE (Item 7b)		23. ADDITIONAL DISTRIBUTION	
24. NAME AND ADDRESS OF ADMINISTRATIVE CONTRACTING OFFICE (Include ZIP Code)		25. NAME AND ADDRESS OF ADMINISTRATIVE CONTRACTING OFFICE (Include ZIP Code)	

DD FORM 254
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REPLACES DD FORM 1, DEC 66 AND DD FORM 254, 1 MAR 66, WHICH ARE OBSOLETE.

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12. INFORMATION PERTAINING TO CLASSIFIED CONTRACTS OR PROJECTS, EVEN THOUGH SUCH INFORMATION IS CONSIDERED UNCLASSIFIED, SHALL NOT BE RELEASED FOR PUBLIC DISSEMINATION EXCEPT AS PROVIDED BY THE INDUSTRIAL SECURITY MANUAL (Paragraph 5a and Appendix 1c).	
PROPOSED PUBLIC RELEASES SHALL BE SUBMITTED FOR APPROVAL PRIOR TO RELEASE <input type="checkbox"/> DIRECT <input type="checkbox"/> THROUGH (Specify)	
TO THE DIRECTORATE FOR SECURITY REVIEW OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (Public Affairs) FOR REVIEW IN ACCORDANCE WITH PARAGRAPH 5a OF THE INDUSTRIAL SECURITY MANUAL	
13. SECURITY CLASSIFICATION SPECIFICATIONS FOR THIS CONTRACT ARE SET FORTH BELOW (Check which are applicable)	
<input type="checkbox"/> DD FORM 134C ATTACHED (Thereby made a part of this specification). <input type="checkbox"/> DOCUMENT(S) LISTED BELOW (Thereby made part of this specification). <input type="checkbox"/> AS STATED BELOW	
14. THIS CONTRACT SECURITY CLASSIFICATION SPECIFICATION AND ATTACHMENTS REFERENCED HEREIN APPROVED BY THE USER AND THE CONTRACTING OFFICER ON HIS REPRESENTATIVE NAMED BELOW	
15. PRIME CONTRACTOR (Item 6a)	
16. ADMINISTRATIVE CONTRACTING OFFICE (Item 14b)	
17. MATERIAL INSPECTOR	
18. ACTING FEDERAL BUREAU OF INVESTIGATION (Include ZIP Code)	
19. SUBCONTRACTOR (Item 7a)	
20. COORDINATE SECURITY OFFICE (Item 7b)	
21. ADDITIONAL DISTRIBUTION	
22. NAME AND ADDRESS OF ADMINISTRATIVE CONTRACTING OFFICE (Include ZIP Code)	

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Contract Security Classification Specification (continued)

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DEPARTMENT OF DEFENSE CONTRACT SECURITY CLASSIFICATION SPECIFICATION (Continued)		
PART OF DD FORM 334, DATED _____	FORM TYPE 41	ON CONTRACT NO. _____
<p>15. For implications of items appearing in the following paragraph list, see Industrial Security Regulations, Section IV, or Industrial Security Regulations, Section V, as applicable. Items requiring classification are those which contain information that would reveal the identity, location, capabilities, or other characteristics of the source, method, means, or equipment used in the production, development, or maintenance of defense articles or services, or the methods, techniques, or processes used in the design, development, or testing of defense articles or services, or the methods, techniques, or processes used in the production, development, or maintenance of defense articles or services, or the methods, techniques, or processes used in the production, development, or maintenance of defense articles or services.</p>		
ELEMENTS OF INFORMATION	CLASSIFICATION	GROUP
A. ACCURACY:		
(1)		
(2)		
B. ALTITUDE		
(1)		
(2)		
C. COUNTER COUNTERMEASURES		
(1)		
(2)		
D. DEPTH:		
(1)		
(2)		
E. DESIGN INFORMATION:		
(1)		
(2)		
F. FORMULA OR MATERIAL:		
(1)		
(2)		
G. FUEL/PROPELLANT:		
(1) TYPE		
(2) CONSUMPTION		
(3) CAPACITY		
H. LETHALITY/CRITICAL EFFECTS:		
(1)		
(2)		
I. MANEUVERABILITY:		
(1)		
(2)		
J. OPERATIONAL READINESS(AIM)		
(1) TIME/TIME CYCLE:		
(2)		
K. ORBIT/TRAJECTORY:		
(1)		
(2)		
L. RANGE:		
(1)		
(2)		

18. (Continued) ELEMENTS OF INFORMATION	CLASSIFICATION	GROUP	REMARKS
a RELIABILITY:			
(1)			
(2)			
b RESOLUTION:			
(1)			
(2)			
c SIGNATURE CHARACTERISTICS:			
(1)			
(2)			
d SPEED/VELOCITY:			
(1) MAXIMUM			
(2) CRUISING			
(3) TAKE OFF OR LAUNCHING			
(4) LANDING			
(5) ACCELERATION AND/OR DECELERATION			
e SYSTEM CAPACITY:			
(1)			
(2)			
f TERMINAL BALLISTICS:			
(1)			
(2)			
g THRUST:			
(1) CLASS			
(2) SPECIFIC			
(3) SPECIFIC IMPULSE			
h VULNERABILITY:			
(1)			
(2)			
i OTHER (Specify. Add additional sheets if necessary.)			
j			
11. END ITEM PRODUCED			
a CLASSIFICATION OF END ITEM			
b EXTERNAL VIEW			
c MILITARY APPLICATION			
d NUMBERS CONTRACTED			
e PRODUCTION AND PROGRAM SCHEDULES			
f RATE OF DELIVERY			
g NUMBERS DELIVERED			
h DEGREE OF PROTECTION IN TRANSIT			
i UNIT COST			
j OTHER (Add additional sheets if necessary)			
k			

know requirement arises at the time of final delivery of goods or services, or upon termination of contract, and also at the conclusion of any previously authorized period of retention. From the standpoint of this particular need-to-know review requirement, there is no difference at all between reference material and all other classified material. For each, the contractor must satisfy the User Agency of his need-to-know. If, however, need-to-know is established for classified material under the classification jurisdiction of the User Agency, then, with respect to the material, the User Agency must also accomplish a security classification review, and prepare a final 254 containing the resulting guidance. With respect to any reference material for which the contractor establishes need-to-know, the authority to retain will not be granted by a final 254 but, instead, will be made known to the contractor by separate documentation. Any grant of retention authority is for a specific period of time, and the same obligations and procedures recur at the end of any such period, if at that time the contractor requests an extension of retention authority.

A fundamental policy carried over into the new plan is that the User Agency is responsible for classification guidance for a classified contract. Within a User Agency, the responsibility attaches specifically to the appropriate program/project/system manager, or equivalent official. Responsibility for the preparation of the guidance, contained in the 254 for a prime contract, attaches exclusively to those officials. Some of the administrative mechanics and the authentication of the 254 by signature, however, are accomplished in all cases by the User Agency procuring contracting officer (PCO) or his authorized representative. Traditionally, reference has been made to the PCO as the source of the content of the 254, but this must be understood to have been and to be a shorthand term descriptive of the fact that the PCO is merely acting as the authenticating agent for the program/project/system manager or other equivalent official concerned.

At this point, it is essential to refer

to the administrative contracting officer (ACO). Sometimes the ACO function is retained by the User Agency and is not delegated to the Defense Contract Administration Services (DCAS) of the Defense Supply Agency. In other cases, this ACO function is delegated. For the sake of clarity, reference hereafter will be made to PCO or ACO as intended, and no distinction will be made between cases where the ACO function is delegated or not delegated.

The ACO enters into the picture of a classified contract, of course, after the contract has been entered into. He has no responsibility for preparation or distribution of the 254 addressed to the prime contractor. It is the ACO's responsibility, however, to surface and bring about resolution by the User Agency of cases in which the 254, as prepared for and distributed to the prime contractor, is found to be inadequate for any reason.

The ACO's function is different with respect to a 254 prepared for a subcontractor. In this situation, the responsibility for preparation of the 254 is placed upon the prime contractor. He will use his own 254 as the basis for the guidance to be stated in the subcontract 254. The ACO, in this situation, must review the proposed subcontract 254. If he finds it adequate and satisfactory, he then becomes the authenticating official charged with signing it and assuring distribution. If problems develop, the ACO has no power to force a resolution in favor of any party. Instead, the ACO is charged with referring the matter to the PCO for consideration and resolution by the program/project/system manager or equivalent official of the User Agency. The relationship of a first tier subcontractor to a second tier subcontractor is essentially similar to that of a prime contractor to a first tier subcontractor, and will not be discussed herein in detail.

During the performance period of a contract, the cognizant security office, assisted by the ACO, is the means by which the security classification guidance furnished for the contract or subcontract is made to work smoothly. The cognizant security office serves as a catalyst to bring about necessary communication

and understanding between the contractor or subcontractor, and those User Agency officials whose ultimate responsibility it is to prepare and interpret the guidance which is set forth in the 254. In no case is it intended that the cognizant security office or the ACO will exercise the power to settle a controversy as to the meaning or sufficiency of particular classification guidance. Of course, common sense, tact, and good judgment will be used to assist the contractor or subcontractor in overcoming his particular difficulty of understanding.

Obviously, the effectiveness of the new plan depends upon a continuing spirit of full cooperation by all parties concerned, and a willingness to take a reasonable and objective view toward making the 254 do its intended job. In this environment, it is inappropriate, and not at all the desire of DOD, that the contractor or subcontractor should feel embarrassed to bring questions of lack of understanding or satisfaction to the attention of the appropriate government officials in the User Agency concerned. In this connection, it is particularly important to know that, for the purpose of interpretation, a particular procedure is provided. This procedure is described very briefly in Item 11 of the 254. Under this procedure, the User Agency may communicate directly with the contractor or subcontractor with appropriate notification to the ACO, although normally such communication would be better made by routing it through the ACO. In the reverse direction, if a contractor or subcontractor desires clarification or to offer suggestion with respect to security classification guidance, he ordinarily must address his inquiry to the User Agency through the ACO. However, if there is a real emergency, the contractor or subcontractor may communicate directly with the User Agency, while concurrently furnishing full information with respect to the communication to the ACO. It will be noted, in this connection, that Item 11 of the 254 requires very specific information as to the identity of the source of information needed for purposes of clarification.

(Continued on Page 37)



FROM THE SPEAKERS ROSTRUM

Address by Dr. Eugene T. Ferraro, Dep. Under Secretary of the Air Force (Manpower), to the First Annual Symposium, Project ARISTOTLE, Washington, D. C., Dec. 7, 1967.

Project ARISTOTLE: The Present and Future

We are here today in response to a call which went out almost 18 months ago at a conference held in June 1966 on "Engineering Systems for Education and Training." This conference was jointly sponsored by the Defense Department, U.S. Office of Education, the Department of Labor, and the National Security Industrial Association (NSIA). It was one of the objectives of that conference to stimulate and maintain a continual momentum of interest in perpetuating a dialogue for the improvement of education and training.

- A dialogue which would engage all facets of our society.
- A dialogue which would challenge all elements of society—not just those elements traditionally and conventionally involved in the educational process.
- A dialogue designed to inspire a broad, interdisciplinary team effort which would concentrate upon training and education, identify problems, and continue the cooperative process of finding solutions.

The dialogue has continued for the past 18 months and has culminated in the formulation of Project ARISTOTLE, and this its first annual symposium. I have been associated with this program since its inception. Accordingly, I want to offer my observations and reflections.

¹ "Status Report: Project ARISTOTLE," Defense Industry Bulletin, Vol. 3, No. 3, September 1967, pp. 4-6.

"Project ARISTOTLE," Defense Industry Bulletin, Vol. 3, No. 3, March 1967, pp. 22-23.

Throughout these months, the Defense Department has maintained its interest in Project ARISTOTLE.

The articles which we have published in our *Defense Industry Bulletin*¹ have created a most favorable reaction. We have received literally hundreds of requests for information regarding ARISTOTLE.

We have sensed a desire to participate and cooperate on the part of educators, industrialists, and professional organizations.

To help people find both the motivation and focus for participation in ARISTOTLE, we must spell out for them the contexts in which it is placed.

It is a context of tremendous national scope.

It is estimated that for all types of schooling our national expenditures run some \$50 billion per year.² The expenditure by industry in training



its workers and managers is estimated in the tens of billions of dollars. Accordingly, in various educational institutions, industry, government agencies, and all kinds of professional organizations, expenditures in education and training may well approach \$80

² Remarks of the Honorable Samuel Ganz, Deputy Manpower Administrator, Department of Labor, "Proceedings of the Engineering Systems for Education and Training Conference," p. 156. (National Security Industrial Association, Washington, D.C. 1966.) (Dollar figure amended for FY 1967 estimate.)

billion annually and, in the not too distant future, will approach \$100 billion—up to 10 percent of our Gross National Product.

However, the dollar expenditure is but one element in establishing and assessing the importance and benefits of improved education and training systems.

We have come to recognize and appreciate fully education and training as:

- Enriching our cultural life.
- Enabling more of our people to become effective as citizens.
- Contributing enormously to economic growth by serving as investments, i.e., by adding to the productivity of American labor as a capital investment.

It is in this context then—the socio-economic context of our national life—within which we must examine Project ARISTOTLE. It is in this view that we must seek answers to the following questions:

What has ARISTOTLE accomplished to date?

What form should ARISTOTLE take in the future?

Under an NSIA Steering Committee, chaired by Marvin Kahn, 10 functional task groups were formed to address the specific objectives "key-noted" in June 1966. The objectives of these 10 task groups were designed to interlock in such a way as to give thorough and systematic attention to all functional elements of a total educational system. The task groups were also designed to—and did—attract wide participation from persons and groups heretofore uninvolved in education on a national scale.

In the past day and a half we have seen the results of that planning. We have heard excellent expositions of the state of the art in computers, communications, trainers and simulators, evaluation standards, and media.

We have been given an exciting glimpse into the future—and perhaps

not too distant future—of individualized instruction, biochemical learning, and sophisticated educational systems.

We have received excellent suggestions in several areas, such as instructor-training and utilization, and information interchange, which are of current and ongoing concern, not only to us in the Defense Department but to all concerned.

Finally, we have not forgotten that our initial and overall objective was to facilitate the matching of problems with potential solutions. We have given attention to the questions inherent in a government/education/industry interface.

All this evidence leads me to conclude that the basic task group structure of ARISTOTLE is sound, and should be continued.

We should continue emphasis upon periodic symposia where the results of the task group efforts can be disseminated.

We should give serious attention to compiling the work of the several task groups into proceedings to be published before these symposia so as to afford an opportunity for careful and critical review during the conference.

What has to be done, and by whom?

Let me orient myself from my vantage point of experience, and to you, who represent other fields, may I suggest you infer other orientations. In the Defense Department, our primary interest in education and training stems clearly from both a Presidential and Congressional mandate to procure and train manpower to develop, procure and employ weapons for our national security objectives.

We commit impressive amounts of resources, both dollars and manpower, to fulfill this mandate.

- Over \$4 billion annually for education and training.

- One-tenth of our four and one-half million military and civilian personnel are in training at any given time; with one instructor or support personnel committed for each four trainees.

Yet, and this may surprise you, only 12 percent of our people are trained in skills directly associated

with firing weapons of some sort. The remaining 88 percent are trained in:

- Technical skills—50 percent.
- Supply and administration—33 percent.
- Medical and dental specialties—5 percent.³

So our education and training problems are not too unlike those of the private sector.

Yet, added to this Service requirement for education and training which ultimately benefits the nation, we have recently assumed further responsibilities to contribute to the enhancement of our country's social goals.

In Project 100,000 we have seized an opportunity to make a meaningful impact on significant numbers of the nation's youth. We will take young people and start them on the road to become productive citizens with employable skills, and in the process aid in the achievement of our fundamental mission—the development of military manpower.

In Project TRANSITION we will give further opportunity to young men already headed in the right direction to reach even higher levels of personal and skill achievement.

Hence, historically and as currently assumed, the Defense Department has

³ *Remarks of the Honorable Thomas D. Morris, Assistant Secretary of Defense (Manpower), "Proceedings for the Engineering Systems for Education and Training Conference," op cit., passim.*



Dr. Eugene T. Ferraro

become a most effective part of the educational community, in its broadest concept.

Because our Armed Services have traditionally been innovators, we can exploit this kinship by serving as a laboratory wherein new techniques and equipment might be tested. We are a closed loop system—we train, we employ, we test, we improve and recycle continuously.

But we must remember the caveat of 1966 in this regard.⁴

We should not oversell this opportunity solely, or even primarily, as an opportunity for large contracts or profits. Rather, the values we will seek are to produce more effective men through more effective education and training. These are the values we share with everyone in the educational community or of which we are a part—a most significant one. Our basic job is education and training. These are the values we pledge to support, along with other government agencies and with society at large.

What should be the role and the responsibility in ARISTOTLE for educators, educational institutions, and their related professional organizations?

Our answer must be clear and emphatic—it is indeed the major role. The Defense Department has assumed further and significant obligations—as we have noted—to the American society. While these programs are of major national impact, they are small in comparison to the overall problems of education on a national scale.

Educators must continue to lead and guide our total national educational effort.

To this end educators and their professional associations must become a partner with Government and industry on a scale broader than ever before conceived. They must articulate the key problems we face as a nation cogently and forcefully. They must encourage and guide the application of the creativeness and talents of all other segments of our society to the solution of those problems. Finally, they must point the way for the involvement of a broad spectrum of academic disciplines in the social sciences and engineering,

⁴ *Ibid.*, p. 18.

and indicate the alternatives industry may take in seeking the necessary marriage between the social sciences and engineering—specifically, education.

What role should industrial organizations play?

To my view industry must stop, look and listen to the articulated requirements of educators, and to those expressed by various government agencies. This conference has provided that occasion.

Industry must be prepared to subject these requirements to the rigors of the methods of modern management. It must explicitly translate operational need into definable products (program definition). It must act as the catalyst in program design, development and implementation (the acquisition phase). It must give its attention to the costs and benefits of particular programs, to innovative analysis and novel approaches to problems, and to the application of advanced techniques which will provide visibility, structure, and direction to various optional programs.

Above all, it must proceed cautiously into the hardware phase, giving equal attention to all elements of the system.

Parenthetically, I would like to note two particularly good expositions on the application of the "systems approach" to education and training:

- The paper prepared by Task Group No. 6—Dr. Lehmann's group.
- The symposium on "Systems Analysis in Education", held by the U.S. Office of Education in Washington on November 20-22, 1967.

Education can never be the same with the application of these techniques.

Where do we go from here? Under what guidelines, toward what objectives, and with what leadership?

In his Denver speech to the National Association of Education Broadcasters on November 7, 1967, Secretary of Defense Robert McNamara suggested the appropriate answer. In his words:

This nation is immensely powerful—both in material and human resources.

We can curb aggression abroad. And we can meet our pressing social problem here at home. And we can do both at the same time if we will use wisely existing institutions and available resources.

With these guidelines, then, I suggest we go forward to the future.

• Continue ARISTOTLE in its task group format, changing the composition and subjects to meet changing needs.

• Look to educators and educational associations for the leadership, articulation and participation on the broadest and most intensive scale, and offer advice, counsel and urgings, as required.

• Continue to look to government agencies at all levels, local to national, for a definition of trends and needs which can be responded to by science and research in industry.

• Look to industry to recognize and appreciate that its involvement in education and training, while now significant, is but the beginning of a massive national and international effort which is at the root of increased productivity and creativity. Education is among the newest and most promising growth industry in our nation—in fact, in the world at large.

In the traditional American style, we are set on a new task of optimizing the potential of this new and great growth industry. To these ends, we must also follow the traditional American style of private initiative and private investment. Again, in a pluralistic way at every level of our Government and of society at large, education and training is everybody's business and the nation's total concern.

International Law of the Sea

(Continued from Page 19)

neither the installations nor their safety zones may be established if they interfere with the use of "recognized sea lanes essential to international navigation."³¹ The importance of this provision is amply illustrated

by the fact that there are already 21,000 structures associated with oil and gas exploitation in the Gulf of Mexico alone.

The Continental Shelf Convention is, prospectively, the most important of the four conventions adopted at Geneva, converting, as it has, unilateral state claims into a rather comprehensive codification of international law. As mentioned previously, Article 1 defines the continental shelf as an area adjacent to the coast to a depth of 200 meters³² or, beyond that limit, to the extent that the depth of the water permits exploitation of the natural resources. This is an open-ended definition—*depth of 200 meters or depth of exploitability*. Although the "exploitability" test does not meet the normal legal requirement of certainty, it does have the advantage of flexibility and makes the Convention applicable without change to future situations brought about by increasing success in exploring the oceans. Of course, this second criterion tends to make the scope of the Convention ambiguous and has already created heated discussions among international lawyers.

Although the Convention on the Continental Shelf does not solve all of the legal problems that will arise in the future exploitation of this area, it will certainly provide a sound foundation for the orderly development of the ocean's shelf resources. Considering the embryonic stage of ocean technology and the relative accessibility of shelf as opposed to deep ocean resources, it is reasonable to predict that increasingly numerous conflicts of uses will arise on and over the continental shelf. Thus, in a practical sense, the Convention codifies a system of order responsive to the needs of today.

²⁹ *Id.*, art. 5, par. 1. The need for this provision is apparent when it is considered that there are already shelf platforms in existence which cover more than 1 acre and extend 300 feet in the air. The problem of balancing the conflict between exploitation of the continental shelf and other uses, particularly that between oil and gas extraction and fishing, is becoming a matter of increasing public concern. See H.R. 11460, H.R. 11684, H.R. 11984, H.R. 11988, and H.R. 12007, 90th Cong. 1st Sess. (1967) (all concern the establishment of marine sanctuaries and would place a moratorium on development of the continental shelf in designated areas).

³⁰ Continental Shelf Convention, *supra* note 10, art. 5, pars. 2 and 3.

³¹ *Id.*, art. 5, par. 6.

³² 656 feet; 109.38 fathoms.

DOD-Industry Group Formed To Deal with Resource Management Problems

The establishment of the DOD-Industry Assets Management Systems Advisory Committee has been approved by the Assistant Secretary of Defense (Administration). The committee is comprised of representatives of Office of the Secretary of Defense staff offices, the Defense Supply Agency, the Military Services, and recognized industry associations representing defense contractors in aerospace, automotive, electronic and shipbuilding industries.

Purpose of the committee is to provide a channel for the industrial community and DOD representatives to discuss problems involved in the implementation of Resource Management Systems. These systems provide DOD and industrial managers with information necessary to evaluate contractual progress and the utilization of labor, technical skills, materials and other resources involved in major defense contracts.

The committee is guided by a charter and by the stated objectives of DOD Directive 7000.1, "Resource Management Systems of the DOD." Functions of the committee, as stated in the charter, are to:

- Serve as a nucleus for constructive DOD-industry collaboration in the implementation of Resource Management Systems.
- Provide timely information from industry to DOD concerning current implementation problems, associated with the installation of Resource Management Systems, that affect both DOD and industry.
- Consider industry-recommended solutions to implementation problems of Resource Management Systems.
- Recommend, where possible, solutions to implementation problems on Resource Management Systems.

Colonel Herbert Waldman, USAF, Director for Assets Management Systems, Office of the Assistant Secretary of Defense (Comptroller), is the chairman of the committee. Other DOD members are:

E. J. Engoron
Office of the Director, Defense
Research and Engineering

E. B. Bennewitz
Office of the Assistant Secretary
of Defense (Installations and
Logistics)

Dr. D. Rice
Office of the Assistant Secretary
of Defense (Systems Analysis)

R. E. McKelvey
Office of the Assistant Secretary
of the Army (Financial
Management)

Earl Kuhl
Office of the Special Assistant to
the Secretary of the Navy for
Management Information

A. E. Fitzgerald
Office of the Assistant Secretary
of the Air Force (Financial
Management)

J. R. Jones Sr.
Defense Supply Agency

Members of the committee who represent industry are:

Stanley M. Sjosten
National Security Industrial Association (Melpar, Inc.)

William L. Dewey
Automobile Manufacturers Association (Chrysler Corp.)

C. Ronald Millkin
National Aerospace Services Association (United Aircraft Corp.)

Philip A. Huey
National Association of Manufacturers (North American Rockwell Corp.)

Gerald R. Marks
Shipbuilders Council of America
(General Dynamics Corp.)

G. L. Warrick
Aerospace Industries Association
(General Electric Co.)

Charles Macbeth
Western Electronic Manufacturers
Association (Hughes Aircraft
Co.)

Additional information regarding the committee can be obtained from J. M. Turner, Aerospace Industries Association, 1725 DeSales St. NW,

Washington, D.C. 20036, Phone (202) 347-2315, who is the project officer for the Council of Defense and Space Industry Associations; or from Lieutenant Colonel W. J. Mehl, Office of the Assistant Secretary of Defense (Comptroller), Room 1B 669, The Pentagon, Washington, D.C. 20301, Phone (202) OXford 7-7514.

Challenge of Marine Sciences

(Continued from Page 6)

mission and the council are independent, we are at the same time working harmoniously together toward common goals. We are looking forward to the commission's recommendations to the President and to the Congress concerning a national plan and the most appropriate future structure of the Federal Government to carry out statutory purposes.

Most of the mysteries of the sea remain cloaked before us. Most of its resources remain untapped. Most of its potential to serve national goals remains unawakened. To realize this opportunity depends on a creative partnership of our Federal Government with the states, with universities and research organizations, and with industry.

We also look forward to increased activities by other nations with whom we seek further international cooperation and collaboration—in scientific research and in a framework of law by which the sea may serve all men.

Pure logic and practical economics dictate this program. However, not to be forgotten is man's compelling desire to explore and to understand the world around him. The spirit which has carried us to rugged mountain peaks, remote polar icecaps, and distant reaches of outer space now propels us to the ocean depths. This spirit is fortified with a confidence developed by past contributions of science that we will not only conquer the ocean depths, but will use them in satisfying the needs of our society.

Joint Packaging Symposium To Be Held Feb. 5-7, 1968

The National Security Industrial Association will team up again this year with the Government and Military Services to sponsor a Joint Packaging, Materials Handling and Transportation Symposium and Exposition, to be held Feb. 5-7 at the Sheraton Park Hotel, Washington, D.C.

Assistant Secretary of Defense (Installations and Logistics) Thomas B. Morris will present the keynote address on the morning of the first day. Feature attraction of the afternoon will be a panel of senior representatives from the four Services to address attendees on the "Logistic Requirements for the Forward Area."

Containerization is the theme for the entire second day of the program. The morning sessions will be devoted to an appraisal of the state of the art, and the afternoon will be dedicated to a panel discussion on "The Implications of Military Usage."

The third day's program, which is a morning meeting only, will be devoted to the military's "Future Developments in Distribution."

The contact for additional information on the symposium is:

Floyd B. T. Myhre
National Security
Industrial Association
1030 15th St. NW
Washington, D. C. 20005
Phone: (202) 296-2266

Large Press Study Contracts Awarded

The Air Force has named three contractors to study possible designs for a large hydraulic closed die forging press.

Companies awarded contracts were: Aluminum Co. of America, Pittsburgh, Pa.; Wyman-Gordon Co., Worcester, Mass., and the Ladish Co., Cudahy, Wis.

Value of the three contracts totals \$76,850.

Air Force Systems Command's Materials Laboratory, Wright-Patterson AFB, Ohio, is sponsoring the program through its manufacturing Technology Division. Ted S. Felker is the project engineer.

Oceanography Study Kits Available

Ocean Science Study Kits especially suited for students and teachers, prepared by the U.S. Naval Oceanographic Office, are available for public purchase. The kits have been assembled to provide secondary schools with interesting information on the rapidly developing fields of oceanography and ocean engineering.

The student kits are composed primarily of reading materials and charts selected for interest to students of high school age. In addition, several exercises are included which will give the student first-hand experience in contouring, charting, and data interpretation.

The teacher kits contain the same

information, with additional material to give the teacher background in providing guidance to the student.

These kits are priced at \$3.20 each for the teacher kit, and \$1.60 each for the student kit. Purchase requests should be accompanied by a check or money order made payable to the U.S. Naval Oceanographic Office.

Mail orders from purchasers located west of the Mississippi River should be sent to: Naval Oceanographic Distribution Office, Clearfield, Utah 84016. Orders from all other locations should be addressed to: Naval Oceanographic Distribution Office, 5801 Tabor Ave., Philadelphia, Pa. 19120.

High Quality Potatoes Pay Off for Small Company

One of the smallest of the many small firms doing business with the Defense Department has been cited for the extremely high quality of its product.

The John Misich Co. of Snohomish, Wash., has been given the Defense Personnel Support Center's quality award for supplying 3.5 million pounds of potatoes, most of them for troops overseas, without a single product rejection for quality.

Primarily a family operation, the company is engaged in farming and packing potatoes, and has an average of 10 full- or part-time employees. They include firm president John Misich, his wife who works in the office, and a son who works in the warehouse and in the field.

An active bidder on government potato procurements since 1963, the firm holds the record for the largest potato contract awarded by the Defense Personnel Support Center's Seattle Subsistence Regional Headquarters, a \$53,160 contract awarded in December 1966.

The quality award was presented to the firm during formal ceremonies at the Seattle headquarters by Colonel Donald G. Bussey, USAF, Deputy Commander, Defense Personnel Support Center. The company will receive a "Q" flag which it can fly over its main building.

Airline Assists Lady Marines

The international appeal of an airline stewardess has been adopted as the 1968 model for the women of the U.S. Marine Corps.

Since February 1967, 20 women marines have reported, two at a time, for a one-week tour of duty in the grooming laboratory of Pan American World Airways' International Stewardess School in Miami, Fla. Their mission is to learn how the glamorous and gracious airline stewardess gets that way, and to bring back the secret to the Marine Corps.

The young women, who have completed Pan American's image development course, have already carried the program to major Marine bases in Hawaii, California, and North and South Carolina. In addition, a grooming laboratory has been established in Quantico, Va., where the Marine Corps trains its women officers.

Extremely popular with the women trainees, the new emphasis on image development is viewed with equal enthusiasm by former Lady Leathernecks, who on Feb. 13 will join their active duty sisters in celebrating the 25th anniversary of the Women Marines. The general consensus is that, after 25 years, the women have finally arrived at their own version of the Corps' traditional spit and polish.



MEETINGS AND SYMPOSIA

APRIL

Second National Conference on Space Maintenance and Extra-Vehicular Activities, April (date undetermined), at Las Vegas, Nev. Sponsors: Air Force Aero Propulsion Laboratory, LTV, Inc., and National Aeronautics and Space Administration. Contact: Mr. Clodfelter, (APFT), Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55875.

International Conference on Light Scattering Spectra in Solids, April (date undetermined), at U. S. Army Research-Durham, Durham, N. C. Sponsor: U. S. Army Research Office-Durham. Contact: Dr. Charles Boghosian, Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285, Ext. 34.

Symposium on the Structure of Low Medium Mass Nuclei, April (date undetermined), at University of Kansas, Lawrence, Kan. Sponsors: Aerospace Research Laboratories, University of Kansas and North Carolina State University. Contact: Dr. G. I. Harris, (ARP), Aerospace Research Laboratories, Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3613.

Fifth Symposium on Remote Sensing of Environment, April 16-18, at University of Michigan, Ann Arbor, Mich. Sponsors: Office of Aerospace Research, Office of Naval Research and Department of Agriculture. Contact: C. E. Molineaux, (CRJT), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3620.

International Symposium on Turbulence of Fluids and Plasmas, April 16-18, at Waldorf-Astoria Hotel, New York, N. Y. Sponsors: Microwave Research Institute of Polytechnic Institute of Brooklyn, Air Force Office of Scientific Research, Office of Naval Research and Department of the Army. Contact: Lt. Col. Robert B. Kalisch, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5518; or Jerome Fox,

Polytechnic Institute of Brooklyn, 333 Jay St., Brooklyn, N. Y. 11201, Phone (212) 643-2393.

Conference on Atomic Physics, April 17-20, in New York, N. Y. Sponsor: Office of Aerospace Research. Contact: D. L. Wennersten, (SRPP), Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5454.

Photochemistry and Radiation Chemistry Symposium, April 22-24, location undetermined. Co-sponsors: U. S. Army Natick Laboratories and National Academy of Sciences-National Research Council Advisory Board. Contact: Dr. E. Hayon, Head, Physical Chemistry Laboratory, U. S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000, Ext. 137.

Annual Frequency Control Symposium, April 22-24, at Shelburne Hotel, Atlantic City, N. J. Sponsor: Electronic Components Laboratory, U. S. Army Electronics Command. Contact: Dir., Electronics Components Laboratory, U. S. Army Electronics Command, Attn.: AMSEL-KL-ST, M. F. Timm, Fort Monmouth, N. J. 07703, Phone (201) 535-2826.

MAY

Second International Conference on Vacuum Ultraviolet Radiation Physics-Interaction with Solids, May 1-3, at Gatlinburg, Tenn. Co-sponsors: U. S. Army Research Office-Durham and Office of Naval Research. Contact: Dr. Robert Mace, Dir., Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285.

Fifth National Colloquium on Information Retrieval, May 3-4, at University of Pennsylvania, Philadelphia, Pa. Sponsors: Moore School of Electrical Engineering, University of Pennsylvania, Institute of Electrical and Electronics Engineers, Special Interest Group on Information Retrieval, American Documentation Institute, Association for Computing Machinery and Frankford Arsenal.

Contact: George Schechter, Chief, Objectives Analysis Office, Frankford Arsenal, Philadelphia, Pa. 19137, Phone (215) JE 5-2900, Ext. 3219.

Fourth International Conference on Universal Aspects of Atmospheric Electricity, May 12-18, in Tokyo, Japan. Sponsors: Air Force Cambridge Research Laboratories, Office of Naval Research and National Science Foundation. Contact: Capt. J. H. Shock, (CRTE), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3636.

Security Classification

(Continued from Page 31)

A few comments are necessary with respect to the completion of Item 14 of the 254. It is in this item that the authenticating PCO or ACO must place his signature. The formula for completing this item is as follows: On all 254s addressed to prime contractors or provided in connection with an RFQ, RFP, or IFB issued to potential prime contractors, the signature line and Item 14a will be completed; Item 14b will be marked not applicable. In all other cases, the signature line and both Item 14a and 14b will be completed.

The fundamental objective of the new plan of providing security classification guidance for the defense industry is to assure that the User Agencies will assume and fulfill their responsibility in providing classification guidance in the form of an itemized list of specific areas of information, with comprehensive narrative comment to fill out the individual aspects of each of those areas; to assure the currency of this guidance; and to motivate and facilitate candid, orderly, and objective intercommunication between the parties on both sides of the contract. It is believed that the new plan has significantly clarified the relationship of the parties to a 254, and has reduced the overall administrative burden of preparing, issuing, distributing and reviewing these documents.

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions, Manpower in Thousands, Quarters by Calendar Year)

	1966				1967								
	I	II	III	IV	I	II	III	IV	Aug	Sep	III	Oct	Nov
I. Military Prime Contract Awards													
Aircraft	\$ 1,945	\$ 2,989	\$ 2,696	\$ 2,262	\$ 2,102	\$ 3,049	\$ 394	\$ 636	\$1,483	\$ 2,513	\$1,249	\$ 578	
Missile & Space Systems	1,040	987	1,314	861	1,230	1,166	535	521	524	1,580	323	429	
Ships	355	491	876	239	679	407	178	104	135	417	153	147	
Weapons & Ammunition	555	1,486	692	940	818	1,769	92	415	597	1,104	454	451	
Electronic & Communications Equip.	918	1,574	666	915	971	1,848	169	364	283	816	272	247	
Other Hard Goods	843	1,842	660	1,029	915	1,564	202	355	228	785	252	153	
Soft Goods	709	922	1,078	989	638	652	588	280	188	1,056	175	118	
Construction	207	392	198	150	232	626	56	100	76	232	56	44	
All Other	1,406	1,963	2,356	1,639	1,605	1,987	1,194	568	573	2,335	522	486(p)	
Total (Excl. Work Outside U.S.)	7,978	12,646	10,536	9,024	9,190	13,068	3,408	3,843	4,087	10,838	3,456	2,653(p)	
Total Seasonably Adjusted	8,703	10,144	10,716	10,149	10,171	10,667	3,610	3,686	3,665	10,961	3,665	3,329(p)	
Work Outside U.S.	521	1,195	856	672	453	834	314	382	195	891	193	118(p)	
II. Gross Obligations Incurred													
Operations	8,326	9,604	10,426	9,702	10,229	11,435	3,700	3,835	3,689	11,224	3,776		
Procurement	4,374	8,539	5,368	5,276	5,113	8,948	1,045	1,894	3,215	6,154	2,699		
Other	2,429	3,470	3,453	2,230	2,519	3,510	1,246	1,062	1,112	3,420	860		
Total	15,129	21,613	19,247	17,208	17,861	23,893	5,991	6,791	8,016	20,798	7,335		
III. Gross Unpaid Obligations Outstanding													
Operations	3,828	3,777	4,792	5,024	4,644	4,513	NA	5,115	5,267	5,267	5,270		
Procurement	18,028	22,119	22,736	23,173	22,780	25,248	NA	23,874	24,925	24,925	25,423		
Other	5,747	7,392	8,179	7,888	7,626	8,270	NA	8,559	8,722	8,722	8,599		
Total	27,598	33,288	35,707	36,085	35,050	38,031	NA	37,548	38,914	38,914	39,292		
IV. Net Expenditures													
Operations	7,689	9,076	8,968	9,087	10,002	10,731	2,898	3,722	3,382	10,001	3,641	3,456	
Procurement	3,651	3,886	4,392	4,264	5,074	5,282	2,037	1,982	2,041	6,060	2,005	1,890	
Other	2,757	2,647	2,484	3,092	3,179	2,001	1,231	883	933	3,047	789	846	
Total	14,097	15,609	15,844	16,443	18,255	18,014	6,166	6,587	6,356	19,108	6,435	6,192	
V. DOD Personal Compensation													
Military	3,181	3,249	3,551	3,606	3,624	3,646	1,310	1,260	1,272	3,842	773	775(p)	
Civilian	1,937	2,015	2,105	2,135	2,170	2,248	736	793	742	2,271			
Total	5,118	5,264	5,656	5,741	5,794	5,894	2,046	2,053	2,014	6,113			
VI. Outstanding Payments													
Advance Payments	66	79	90	83	92	80				110			
Progress Payments	4,402	4,346	4,750	5,461	5,981	6,765				7,179			
Total	4,468	4,425	4,840	5,544	6,073	6,845				7,289			
VII. Strength (Manpower)													
Military	2,969	3,094	3,229	3,334	3,371	3,377	3,382	3,393	3,412	3,412	3,416(p)		
Civilian	1,088	1,138	1,184	1,230	1,268	1,303	1,311	1,306	1,274	1,274	1,277	1,277(p)	

NA=Not Available

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis.

Directorate for Statistical Services
OASD (Comptroller)
Dec. 28, 1967

STATUS OF FUNDS

DEPARTMENT OF DEFENSE

Military Functions and Military Assistance Program

Quarterly Report

Prepared by:

Directorate for Financial Analysis and Control
Office of the Assistant Secretary of Defense (Comptroller)
Room 3C 839, The Pentagon Phone: (202) OXford 7-2332

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Expenditures

First Quarter, Fiscal Year 1968

(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	1,217,423	1,544,372	1,522,525	4,284,320	850,076	1,212,519
Reserve forces	185,494	132,697	37,425	305,616	149,863	123,766
Retired pay	163,448	166,985	167,152	497,585	7,622	6,465
Undistributed	78,414	-16,946	37,751	99,219	—	-99,219
Total—Military Personnel	1,594,779	1,827,107	1,764,853	5,186,739	1,007,561	1,243,531
Operation and Maintenance	1,303,172	1,894,523	1,616,697	4,814,392	3,542,486	4,023,587
Procurement						
Aircraft	781,968	853,017	813,632	2,448,617	9,317,974	8,765,933
Missiles	195,134	161,789	150,406	507,329	1,929,015	1,867,649
Ships	104,941	115,715	131,016	351,672	3,049,781	3,010,393
Tracked combat vehicles	25,913	42,853	25,757	94,523	632,680	695,979
Ordnance, vehicles, and related equipment	580,756	452,477	523,648	1,556,881	6,721,730	7,382,390
Electronics and communications	89,708	96,770	139,661	326,139	1,998,176	1,987,918
Other procurement	5,139	281,706	124,948	411,793	1,947,502	1,972,914
Undistributed	253,783	-22,750	131,948	362,981	-386,056	-757,752
Total—Procurement	2,037,342	1,981,580	2,041,015	6,059,937	25,210,802	24,925,421
Research, Development, Test, and Evaluation						
Military sciences	82,373	98,419	74,072	254,864	867,381	826,678
Aircraft	99,615	85,906	116,473	301,994	796,125	915,226
Missiles	197,681	240,774	200,876	639,331	1,095,907	1,608,433
Astronautics	141,723	91,004	85,193	317,920	649,793	618,917
Ships	39,303	31,410	23,105	93,818	212,773	224,357
Ordnance, vehicles, and related equipment	24,510	34,682	28,938	88,130	235,442	261,416
Other equipment	54,148	63,184	63,882	181,214	541,757	571,005
Program-wide management and support	39,650	37,048	40,505	117,203	163,038	174,340
Undistributed	86,404	29,816	39,057	155,277	-194,032	-350,352
Total—Research, Development, Test, & Eval.	765,409	712,242	672,099	2,149,750	4,368,185	4,850,058
Military Construction	105,390	126,470	99,037	330,897	1,581,256	1,475,628
Family Housing	40,655	44,780	44,232	129,717	114,964	151,981
Civil Defense	1,872	13,870	9,683	25,425	91,893	80,340
Other—Special Foreign Currency Program	26	40	41	107	2,193	2,086
Revolving and Management Funds	302,615	-42,408	83,293	343,500	527,834	234,297
Subtotal—Military Functions	6,151,260	6,558,205	6,330,999	19,040,464	36,447,172	36,986,927
Military Assistance	15,077	27,575	24,579	67,231	2,112,357	2,161,842
TOTAL—DEPARTMENT OF DEFENSE	6,166,337	6,585,780	6,355,577	19,107,694	38,559,529	39,148,769

NOTE: Detail may not add to rounded totals.

DEPARTMENT OF THE ARMY

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	418,815	612,951	648,592	1,680,358	392,872	602,924
Reserve forces	101,491	102,645	15,786	219,922	112,152	82,694
Undistributed	63,721	—24,895	32,021	70,847	—	—70,847
Total—Military Personnel	584,027	690,701	696,399	1,971,127	505,024	614,771
Operation and Maintenance	401,731	636,103	620,206	1,658,040	1,252,029	1,565,353
Procurement						
Aircraft	82,765	101,937	92,367	277,069	1,303,735	1,154,350
Missiles	32,512	49,898	—15,470	66,940	458,264	450,092
Tracked combat vehicles	25,872	42,759	25,228	93,859	611,133	672,833
Ordnance, vehicles, and related equipment	202,125	251,434	244,080	697,639	3,387,912	3,739,707
Electronics and communications	7,055	27,620	56,145	90,820	780,554	844,432
Other procurement	7,241	57,528	63,051	127,820	817,300	866,795
Undistributed	238,697	—26,330	132,185	344,552	—386,056	—739,330
Total—Procurement	596,266	504,848	597,585	1,698,699	6,972,842	6,998,879
Research, Development, Test, and Evaluation						
Military sciences	13,387	14,251	8,601	36,139	133,665	143,235
Aircraft	17,868	9,920	15,262	43,050	85,463	104,373
Missiles	51,305	62,052	53,355	166,712	435,876	600,544
Astronautics	645	3,004	2,313	5,962	15,069	12,200
Ordnance, vehicles, and related equipment	9,799	17,836	13,565	41,200	136,432	162,851
Other equipment	19,112	24,207	22,707	66,026	218,437	226,438
Program-wide management and support	7,067	6,235	8,901	22,203	39,835	46,612
Undistributed	74,408	22,935	24,121	121,464	—194,032	—316,544
Total—Research, Development, Test, & Eval.	193,492	160,439	148,824	502,755	870,745	979,759
Military Construction	50,246	158,895	36,803	245,944	818,076	666,348
Revolving and Management Funds	173,143	—58,597	71,871	186,417	58,732	— 69,801
TOTAL—DEPARTMENT OF THE ARMY	1,998,904	2,092,390	2,171,687	6,262,981	10,477,449	10,745,307

DEPARTMENT OF THE NAVY

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	355,829	455,409	418,431	1,229,669	232,405	346,514
Reserve forces	14,127	16,081	12,059	42,267	19,698	20,146
Undistributed	14,638	-14,547	12,036	12,127	—	-12,127
Total—Military Personnel	384,594	456,943	442,526	1,284,063	252,103	354,533
Operation and Maintenance	393,573	609,630	396,437	1,399,640	1,234,696	1,170,381
Procurement						
Aircraft	240,244	248,355	248,450	737,049	3,505,672	3,030,480
Missiles	54,257	25,600	44,242	124,099	470,557	486,888
Ships	104,941	115,715	131,016	351,672	3,049,781	3,010,303
Tracked combat vehicles	41	94	529	664	21,547	23,146
Ordnance, vehicles, and related equipment	142,312	80,727	123,141	346,180	1,611,746	1,651,914
Electronics and communications	33,263	35,309	42,786	111,358	656,377	595,859
Other procurement	62,728	55,697	60,359	178,784	921,116	933,209
Undistributed	7,705	-2,821	3,878	8,762	—	-8,762
Total—Procurement	645,491	558,678	654,400	1,858,569	10,236,796	9,729,125
Research, Development, Test, and Evaluation						
Military sciences	18,424	19,761	11,161	49,346	127,323	139,897
Aircraft	25,869	25,239	23,714	74,822	260,838	242,908
Missiles	68,873	95,267	74,592	238,732	293,783	514,756
Astronautics	4,005	1,631	1,359	6,995	12,677	10,975
Ships	39,303	31,410	23,105	93,818	212,773	224,357
Ordnance, vehicles, and related equipment	14,711	16,846	15,373	46,930	99,010	98,565
Other equipment	14,973	8,499	9,964	33,436	89,328	86,134
Program-wide management and support	14,515	9,604	6,763	30,832	97,989	85,339
Undistributed	4,848	-217	2,889	7,520	—	-7,520
Total—Research, Development, Test, & Eval.	205,521	208,040	168,920	582,481	1,193,721	1,395,412
Military Construction	21,947	-80,429	20,591	-31,891	269,300	348,501
Revolving and Management Funds	-57,632	-22,147	60,363	-19,416	462,849	362,848
TOTAL—DEPARTMENT OF THE NAVY	1,593,495	1,730,714	1,749,237	5,073,446	13,649,465	13,360,357

DEPARTMENT OF THE AIR FORCE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	442,779	476,012	455,502	1,374,293	224,799	263,081
Reserve forces	19,876	13,971	9,580	43,427	18,013	20,926
Undistributed	55	22,496	--6,306	16,245	-	-16,245
Total—Military Personnel	462,710	512,479	458,776	1,433,965	242,812	267,762
Operation and Maintenance	431,020	554,374	518,796	1,504,190	955,856	1,188,231
Procurement						
Aircraft	458,959	502,725	472,815	1,434,499	4,508,567	4,575,103
Missiles	108,365	86,291	121,634	316,290	1,000,194	930,669
Ordnance, vehicles & related equipment	235,870	120,099	156,121	512,090	1,719,842	1,988,769
Electronics and communications	48,598	32,849	40,281	121,728	555,915	543,086
Other procurement	--64,917	164,209	1,208	100,590	164,740	127,248
Undistributed	7,900	5,696	--4,254	9,342	--	-9,335
Total—Procurement	794,776	911,958	787,805	2,494,539	7,949,258	8,155,540
Research, Development, Test, and Evaluation						
Military sciences	14,108	11,958	14,704	40,830	131,619	121,448
Aircraft	55,878	50,747	77,497	184,122	449,824	567,985
Missiles	77,503	83,455	72,929	233,887	366,248	493,133
Astronautics	137,073	86,369	81,521	304,963	622,047	595,742
Other equipment	20,063	30,478	31,211	81,752	233,992	253,433
Program-wide management and support	18,068	21,209	24,841	64,118	25,214	42,389
Undistributed	7,148	7,098	12,047	26,293	-	-26,293
Total—Research, Development, Test & Eval.	329,902	291,314	314,749	935,965	1,828,944	2,052,839
Military Construction	31,998	45,169	35,462	112,629	473,206	442,752
Revolving and Management Funds	21,356	68,778	--30,879	59,255	6,252	--42,131
TOTAL—DEPARTMENT OF THE AIR FORCE	2,071,761	2,384,072	2,084,710	6,540,543	11,456,328	12,065,044

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Retired pay	163,448	166,985	167,152	497,585	7,622	6,465
Operation and Maintenance	76,849	94,415	81,258	252,522	99,905	99,572
Procurement						
Ordnance, vehicles, and related equipment	449	217	306	972	2,230	2,000
Electronics and communications	792	992	449	2,233	5,330	4,541
Other procurement	87	4,182	330	4,599	44,346	45,662
Undistributed	-519	705	139	325	—	-325
Total—Procurement	809	6,096	1,225	8,130	51,906	51,877
Research, Development, Test, and Evaluation						
Military sciences	36,494	52,449	39,606	128,549	474,774	422,084
Military Construction	1,200	2,834	181	4,215	20,674	17,967
Family Housing	40,655	44,780	44,282	129,717	114,964	151,981
Other—Special Foreign Currency Program	26	40	41	107	2,193	2,086
Revolving and Management Funds	165,748	-30,441	-18,063	117,244	—	-16,619
TOTAL—DEFENSE AGENCIES/OSD	485,228	337,160	315,680	1,138,068	772,037	735,370

OFFICE OF CIVIL DEFENSE

Civil Defense	1,872	13,870	9,683	25,425	91,893	80,340
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	1,872	13,870	9,683	25,425	91,893	80,340

MILITARY ASSISTANCE

Military Personnel	—	9	23	32	525	529
Operation and Maintenance	9,911	18,399	21,293	49,603	289,568	340,412
Procurement						
Aircraft	1,045	4,920	10,973	16,938	235,101	232,756
Missiles	348	152	148	648	23,650	22,602
Ships	43	655	876	1,574	114,450	118,938
Ordnance, vehicles, and related equipment	7,909	770	7,848	16,527	264,633	271,860
Electronics and communications	7,918	1,989	2,301	12,208	132,402	129,788
Other procurement	5,102	168	1,324	6,594	127,226	133,531
Total—Procurement	22,365	8,654	23,470	54,489	897,462	909,475
Research, Development, Test, and Evaluation	—	-1	-1,076	-1,077	401	176
Military Construction	1,291	412	1,383	3,086	171,824	168,380
Revolving Fund	-15,465	-1,232	-16,053	-32,750	764,607	740,637
Undistributed	-3,024	1,334	-4,463	-6,153	-12,030	2,234
TOTAL—MILITARY ASSISTANCE	15,077	27,575	24,579	67,231	2,112,357	2,161,842

Obligations

First Quarter, Fiscal Year 1968
(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	19,008,259	1,608,760	1,543,081	1,547,239	4,699,080	14,309,179
Reserve forces	958,775	127,776	96,517	57,184	281,477	677,298
Retired pay	2,020,000	163,554	165,448	167,310	496,312	1,523,688
Total—Military Personnel	21,987,034	1,900,090	1,805,047	1,771,734	5,476,871	16,510,163
Operation and Maintenance	21,038,712	1,799,809	2,029,598	1,917,371	5,746,778	15,291,933
Procurement						
Aircraft	12,568,379	368,567	201,444	1,420,862	1,990,873	10,577,508
Missiles	2,987,902	63,425	140,384	276,303	480,112	2,507,790
Ships	4,617,146	117,656	57,684	155,997	331,337	4,285,809
Tracked combat vehicles	346,561	32,519	103,416	23,282	159,217	187,344
Ordnance, vehicles and related equipment	8,288,313	295,510	1,040,214	1,055,758	2,391,482	5,896,831
Electronics and communications	1,828,122	78,388	139,506	116,706	334,600	1,493,522
Other procurement	2,529,417	89,172	211,268	165,855	466,295	2,063,122
Undistributed	2,630,944	—	—	—	—	2,630,944
Total—Procurement	36,796,785	1,045,235	1,893,918	3,214,761	6,153,914	29,642,872
Research, Development, Test, & Evaluation						
Military sciences	1,044,186	70,298	71,677	83,071	225,046	819,140
Aircraft	1,222,397	253,412	107,956	66,789	428,157	794,240
Missiles	2,250,324	299,773	360,280	515,217	1,175,270	1,075,054
Astronautics	1,322,631	199,553	48,716	75,763	324,032	998,599
Ships	178,775	39,409	47,453	24,076	110,938	67,837
Ordnance, vehicles, and related equipment	284,919	24,292	56,576	37,270	118,138	166,781
Other equipment	807,434	72,584	73,028	70,614	216,226	591,208
Program-wide management and support	475,718	68,748	53,367	54,137	176,252	299,466
Emergency Fund	100,000	—	—	—	—	100,000
Undistributed	852,187	—2,152	2,642	—490	—	852,187
Total—Research, Development, Test, & Eval.	8,538,574	1,025,913	821,699	926,447	2,774,059	5,764,515
Military Construction	*1,761,443	66,846	118,211	113,205	298,262	1,463,181
Family Housing	*310,335	889	112,158	55,488	168,535	141,800
Civil Defense	*32,544	5,316	4,967	3,873	14,156	18,389
Other—Special Foreign Currency Program	16,344	511	—	—511	—	16,344
Subtotal—Military Functions	89,481,772	5,844,610	6,785,598	8,002,367	20,632,575	68,849,198
Military Assistance	*396,883	146,736	4,829	13,760	165,325	231,557
TOTAL—DEPARTMENT OF DEFENSE	89,878,655	5,991,345	6,790,428	8,016,127	20,797,900	69,080,755

* Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEPARTMENT OF THE ARMY

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	7,887,358	665,886	629,518	628,200	1,923,604	5,963,755
Reserve forces	644,100	93,434	64,012	34,310	191,756	452,344
Total—Military Personnel	8,531,459	759,320	693,530	662,510	2,115,360	6,416,099
Operation and Maintenance	8,082,343	659,044	765,191	720,848	2,145,083	5,937,259
Procurement						
Aircraft	839,970	6,122	18,257	104,983	129,362	710,608
Missiles	538,417	—609	31,141	43,263	73,795	464,622
Tracked combat vehicles	335,741	32,512	102,438	22,004	156,954	178,787
Ordnance, vehicles and related equipment	4,258,921	85,314	504,365	633,690	1,223,369	3,035,552
Electronics and communications	602,328	48,622	79,877	38,129	166,628	495,700
Other procurement	706,145	11,065	76,572	102,967	190,604	515,541
Undistributed	2,217,566	—	—	—	—	2,217,566
Total—Procurement	9,559,088	183,027	812,649	945,036	1,940,712	7,618,376
Research, Development, Test, & Evaluation						
Military sciences	186,209	27,781	16,064	6,670	50,515	136,694
Aircraft	147,521	45,654	11,162	5,449	62,265	85,256
Missiles	734,987	34,044	29,860	271,325	335,229	399,758
Astronautics	14,060	795	1,107	1,234	3,136	10,924
Ordnance, vehicles and related equipment	204,759	14,539	37,257	19,859	71,655	133,104
Other equipment	403,596	24,743	31,483	21,541	77,767	325,829
Program-wide management and support	83,505	14,551	6,722	9,613	30,886	52,619
Undistributed	160	—2,152	2,642	—490	—	160
Total—Research, Development, Test & Eval.	1,774,799	159,955	136,297	335,201	631,453	1,143,347
Military Construction	*883,466	24,405	48,985	55,963	129,353	754,113
TOTAL—DEPARTMENT OF THE ARMY	28,831,156	1,785,750	2,456,652	2,719,559	6,961,961	21,869,194

* Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEPARTMENT OF THE AIR FORCE

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	5,647,300	480,654	473,889	466,361	1,420,904	4,226,396
Reserve forces	160,055	18,320	17,014	11,362	46,696	113,359
Total—Military Personnel	5,807,355	498,974	490,903	477,724	1,467,601	4,339,754
Operation and Maintenance	6,100,295	667,933	581,775	584,103	1,833,811	4,266,484
Procurement						
Aircraft	7,764,371	305,551	125,090	1,155,532	1,586,173	6,178,198
Missiles	1,613,168	59,820	83,292	114,620	257,732	1,355,436
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,567,923	184,628	489,289	107,098	781,015	786,908
Electronics and communications	447,282	20,404	49,891	44,264	114,559	332,723
Other Procurement	543,637	3,540	66,822	—7,264	63,098	480,539
Undistributed	668,803	—	—	—	—	668,803
Total—Procurement	12,605,186	573,943	814,384	1,414,251	2,802,578	9,802,608
Research, Development, Test, & Evaluation						
Military sciences	186,824	4,406	17,698	12,816	34,920	151,904
Aircraft	937,335	194,734	81,606	32,563	308,903	628,432
Missiles	946,715	178,533	91,040	108,005	377,578	569,137
Astronautics	1,294,567	195,361	46,725	73,517	315,603	978,964
Other equipment	351,843	38,708	26,301	42,645	107,654	244,189
Program-wide management and support	267,943	40,485	26,207	18,712	85,404	182,539
Undistributed	—151,680	—	—	—	—	—151,680
Total—Research, Development, Test & Eval.	3,833,548	652,225	289,579	288,259	1,230,063	2,603,485
Military Construction	*279,837	18,514	38,503	25,702	82,719	197,118
TOTAL—DEPARTMENT OF THE AIR FORCE	28,626,221	2,411,590	2,215,142	2,790,040	7,416,772	21,209,449

* Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

February 1968

DEPARTMENT OF THE NAVY

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	5,473,600	462,220	439,674	452,678	1,354,572	4,119,028
Reserve forces	154,620	16,022	15,491	11,512	43,025	111,505
Total—Military Personnel	5,628,220	478,243	455,165	464,190	1,397,598	4,230,622
Operation and Maintenance	5,817,321	381,376	590,175	532,806	1,504,357	4,312,963
Procurement						
Aircraft	3,964,038	56,894	58,097	160,344	275,335	3,688,703
Missiles	886,317	4,214	25,951	118,420	148,585	687,732
Ships	4,617,146	117,656	57,684	155,997	331,337	4,285,809
Tracked combat vehicles	10,820	7	978	1,278	2,263	8,557
Ordnance, vehicles and related equipment	2,459,282	25,116	46,498	314,742	386,356	2,072,926
Electronics and communications	705,075	9,329	9,449	33,191	51,969	653,106
Other procurement	1,222,275	71,614	66,595	65,358	203,567	1,018,708
Undistributed	—269,068	—	—	—	—	—269,068
Total—Procurement	13,545,883	284,827	265,256	849,328	1,399,411	12,146,472
Research, Development, Test, and Evaluation						
Military sciences	100,121	18,290	8,444	36,730	63,464	36,657
Aircraft	137,541	13,024	15,188	28,777	56,989	80,552
Missiles	568,622	87,196	239,380	135,887	462,463	106,159
Astronautics	14,004	3,397	884	1,012	5,293	8,711
Ships	178,775	39,409	47,453	24,076	110,938	67,837
Ordnance, vehicles and related equipment	80,160	9,753	19,319	17,411	46,483	33,677
Other equipment	51,995	9,133	15,244	6,428	30,805	21,190
Program-wide management and support	124,270	13,710	20,440	25,812	59,962	64,308
Undistributed	1,003,707	—	—	—	—	1,003,707
Total Research, Development, Test & Eval.	2,259,195	193,912	366,352	276,133	836,397	1,422,798
Military Construction	*583,977	22,501	30,941	31,240	84,682	499,295
TOTAL—DEPARTMENT OF THE NAVY	27,834,597	1,360,859	1,707,888	2,153,698	5,222,445	22,612,151

* Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Available for obligation	Obligations ^a				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Retired Pay	2,020,000	163,554	165,448	167,310	496,312	1,523,688
Operation and Maintenance	1,038,753	91,456	92,458	79,613	263,527	775,220
Procurement						
Ordnance, Vehicles and related equipment	2,187	452	62	228	742	1,445
Electronics and communications	13,437	33	289	1,122	1,444	11,993
Other procurement	57,360	2,953	1,279	4,794	9,026	48,334
Undistributed	13,643	—	—	—	—	13,643
Total—Procurement	86,627	3,438	1,630	6,144	11,212	75,415
Research, Development, Test, and Evaluation						
Military sciences	571,032	19,821	29,471	26,855	76,147	494,885
Emergency Fund	100,000	—	—	—	—	100,000
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test & Eval.	671,032	19,821	29,471	26,855	76,147	594,885
Military Construction	*14,163	1,426	—218	300	1,508	12,655
Family Housing	*310,335	889	112,159	55,487	168,535	141,800
Other—Special Foreign Currency Program	16,344	511	—	—511	—	16,344
TOTAL—DEFENSE AGENCIES/OSD	4,157,255	281,095	400,948	335,198	1,017,241	3,140,014

OFFICE OF CIVIL DEFENSE

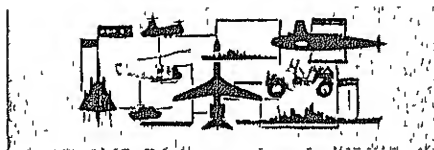
Civil Defense	*32,544	5,316	4,967	3,873	14,156	18,389
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MILITARY ASSISTANCE

Military Personnel	35	44	—1	—8	35	—
Operation and Maintenance	301,516	77,967	7,563	14,918	100,448	201,068
Procurement						
Aircraft	14,680	16,869	—1,813	—463	14,593	87
Missiles	—235	1,363	—1,751	—12	—400	165
Ships	6,062	7,280	—1,150	—68	6,062	—
Ordnance, vehicles and related equipment	23,750	25,768	—1,484	—530	23,754	—4
Electronics and communications	9,596	9,363	64	167	9,594	2
Other procurement	12,959	10,207	2,934	—242	12,899	60
Total—Procurement	66,812	70,850	—3,200	—1,147	66,503	310
Research, Development, Test, and Evaluation	—1,300	—	—1,300	—1	—1,301	1
	29,642	—	358	—	—358	30,000
	177	—2,126	2,126	—	—	177
	*396,883	146,736	4,829	13,761	165,326	231,557

^a Appropriations not yet enacted.

February 1968



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of December 1967:

DEFENSE SUPPLY AGENCY

- 1—General Aniline & Film Corp., New York, N.Y. \$1,080,327. 20,500 rolls of aerial film. Defense General Supply Center, Richmond, Va. DSA 400-68-C-2805.
—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for petroleum products:

JP-5 fuel

Golden Eagle Refining Co., Los Angeles, Calif. \$1,139,460. 8,400,000 gallons. DSA 600-68-D-0920.
Edgington Oil Refineries, Long Beach, Calif. \$1,600,000. 12,000,000 gallons. DSA 600-68-D-0918.
Douglas Oil Co. of Calif., Los Angeles, Calif. \$1,873,600. 15,000,000 gallons. DSA 600-68-D-0932.
Gulf Oil Corp., New York, N.Y. \$1,296,600. 42,000,000 gallons. DSA 600-68-D-0921.
Hess Oil & Chemical Corp., Perth Amboy, N.J. \$2,788,380. 25,200,000 gallons. DSA 600-68-D-0924.
Humble Oil & Refining Co., Houston, Tex. \$9,105,600. 92,400,000 gallons. DSA 600-68-D-0925.
Kern County Refinery, Los Angeles, Calif. \$1,177,812. 8,000,000 gallons. DSA 600-68-D-0926.
Mobil Oil Corp., New York, N.Y. \$8,156,200. 79,000,040 gallons. DSA 600-68-D-0928.
Phillips Petroleum Co., Bartlesville, Okla. \$1,181,275. 9,400,000 gallons. DSA 600-68-D-0920.
Sun Oil Co., Philadelphia, Pa. \$3,292,459. 27,720,000 gallons. DSA 600-68-D-0930.

JP-4 Fuel

Adobe Refining Co., Midland, Tex. \$3,588,950. 33,000,000 gallons. DSA 600-68-D-0938.
Alabama Refining Co., Theodore, Ala. \$2,484,694. 23,572,000 gallons. DSA 600-68-D-0934.
American Oil Co., Chicago, Ill. \$15,352,981. 150,908,000 gallons. DSA 600-68-D-0975.
American Petrofina Co. of Tex., Dallas, Tex. \$3,912,970. 40,000,000 gallons. DSA 600-68-D-0976.
Ashland Oil & Refining Co., Ashland, Ky. \$5,695,590. 53,107,402 gallons. DSA 600-68-D-0977.
Atlantic Richfield Co., Philadelphia, Pa. \$3,501,000. 30,000,000 gallons. DSA 600-68-D-0979.
Atlantic Richfield Co., Los Angeles, Calif. \$2,725,800. 21,000,000 gallons. DSA 600-68-D-0978.
Bayou Refining Co., Pasadena, Tex. \$1,884,369. 18,470,000 gallons. DSA 600-68-D-0938.
Bell Oil & Gas Co., Bartlesville, Okla. \$4,672,839. 50,000,000 gallons. DSA 600-68-D-0940.
Cliffes Service Oil Co., New York, N.Y. \$4,078,667. 42,840,000 gallons. DSA 600-68-D-0982.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract number.

Chevron Oil Co., Denver, Colo. \$1,806,987. 13,488,000 gallons. DSA 600-68-D-1009.
Constat States Petrochemical Co., Houston, Tex. \$20,231,401. 194,460,000 gallons. DSA 600-68-D-0988.
Continental Oil Co., Houston, Tex. \$9,628,368. 95,596,400 gallons. DSA 600-68-D-0984.
Crystal Flash Petroleum Corp., Indianapolis, Ind. \$1,533,022. 13,520,000 gallons. DSA 600-68-D-0948.
Delta Refining Co., Memphis, Tenn. \$4,382,445. 40,000,000 gallons. DSA 600-68-D-0944 and P001.
Derby Refining Co., Wichita, Kan. \$1,065,104. 12,000,000 gallons. DSA 600-68-D-0985.
Douglas Oil Co. of Calif., Los Angeles, Calif. \$2,863,400. 24,000,000 gallons. DSA 600-68-D-0986.
Edgington Oil Refineries, Long Beach, Calif. \$2,366,000. 19,260,000 gallons. DSA 600-68-D-0945.
Fletcher Oil & Refining Co., Wilmington, Calif. \$2,545,000. 20,000,000 gallons. DSA 600-68-D-0948.
Fort Worth Refining Co., Houston, Tex. \$4,405,397. 42,000,000 gallons. DSA 600-68-D-0940 and P001.
Getty Oil Co., New York, N.Y. \$5,013,612. 43,570,800 gallons. DSA 600-68-D-0987.
Good Hope Refineries, Houston, Tex. \$3,573,422. 34,000,000 gallons. DSA 600-68-D-0963 and P001.
Gulf Oil Corp., New York, N.Y. \$15,183,000. 147,000,000 gallons. DSA 600-68-D-0988.
Gulf Oil Corp., Houston, Tex. \$1,135,000. 10,000,000 gallons. DSA 600-68-D-0989.
Hercules Oil Co., Long Beach, Calif. \$1,178,479. 9,000,000 gallons. DSA 600-68-D-0954 and P001.
Hess Oil & Chemical Corp., Perth Amboy, N.J. \$2,875,320. 20,400,000 gallons. DSA 600-68-D-0990.
Howell Refining Co., San Antonio, Tex. \$4,013,251. 38,750,000 gallons. DSA 600-68-D-0955 and P001.
Humble Oil & Refining Co., Houston, Tex. \$2,727,131. 260,800,000 gallons. DSA 600-68-D-0991.
Hunt Oil Co., Dallas, Tex. \$1,423,500. 14,600,000 gallons. DSA 600-68-D-0992.
Kerr-McGee Corp., Oklahoma City, Okla. \$1,410,000. 15,000,000 gallons. DSA 600-68-D-0994.
MacMillan Ring-Free Oil Co., Los Angeles, Calif. \$2,311,400. 18,000,000 gallons. DSA 600-68-D-0991.
Mobil Oil Corp., New York, N.Y. \$11,690,328. 102,422,898 gallons. DSA 600-68-D-0996.
Monarch Refining Co., San Antonio, Tex. \$1,102,032. 10,000,000 gallons. DSA 600-68-D-0993 and P001.
Okmulgee Refining Co., Okmulgee, Okla. \$2,312,200. 23,600,000 gallons. DSA 600-68-D-0996 and P001.
Phillips Petroleum Co., Bartlesville, Okla. \$4,507,415. 40,510,000 gallons. DSA 600-68-D-0997.
Shamrock Oil & Gas Corp., Amarillo, Tex. \$2,658,700. 24,600,000 gallons. DSA 600-68-D-0990.
Shell Oil Co., New York, N.Y. \$1,770,876. 17,640,000 gallons. DSA 600-68-D-1000.
Signal Oil & Gas Co., Houston, Tex. \$1,636,800. 16,000,000 gallons. DSA 600-68-D-0913.
Sinclair Refining Co., New York, N.Y. \$4,489,800. 42,000,000 gallons. DSA 600-68-D-1001.
Sloux Oil Co., Newcastle, Wyo. \$2,410,000. 20,000,000 gallons. DSA 600-68-D-0999.
Southland Oil Co., Yazoo City, Miss. \$1,097,258. 10,500,000 gallons. DSA 600-68-D-0970 and P001.
Standard Oil Co. of Calif. (Western Operations). \$25,052,241. 231,221,600 gallons. DSA 600-68-D-1008.

Sun Oil Co., Philadelphia, Pa. \$8,580,600. 75,600,000 gallons. DSA 600-68-D-1002.
Sunnay DX Oil Co., Tulsa, Okla. \$2,300,924. 23,800,000 gallons. DSA 600-68-D-1003.
Suntide Refining Co., Tulsa, Okla. \$1,052,060. 19,000,000 gallons. DSA 600-68-D-1004.
Tesoro Petroleum Corp., San Antonio, Tex. \$1,510,021. 16,000,000 gallons. DSA 600-68-D-0971 and P001.
Texas City Refining, Texas City, Tex. \$1,061,820. 19,320,000 gallons. DSA 600-68-D-1005.
Golden Eagle Refining Co., Los Angeles, Calif. \$6,433,500. 50,400,000 gallons. DSA 600-68-D-0962 and P001.
Tonkawa Refining Co., Arnett, Okla. \$2,109,252. 20,000,000 gallons. DSA 600-68-D-0972 and P001.
Triangle Refineries, Houston, Tex. \$1,876,424. 10,480,000 gallons. DSA 600-68-D-1006.
Union Oil Co. of Calif., Los Angeles, Calif. \$10,134,726. 86,478,000 gallons. DSA 600-68-D-1007.

Various fuel products

- Marathon Oil Co., New York, N.Y. \$3,542,890. 910,000 barrels of diesel fuel. DSA 100-68-D-0817.
Humble Oil & Refining Co., Houston, Tex. \$3,086,450. 500,000 barrels of automotive type 1; 100,000 barrels of diesel fuel and 25,000 barrels of kerosene. DSA 600-68-D-0808.
Hess Oil & Chemical Corp., Perth Amboy, N.J. \$2,268,582. 555,000 barrels of diesel fuel. DSA 600-68-D-0816.
Texaco, Inc., New York, N.Y. \$3,511,200. 800,000 barrels of automotive gasoline type 1. DSA 600-68-D-0822.
Standard Oil Co. of Calif., San Francisco, Calif. \$1,300,825. 245,000 barrels of gasoline. DSA 600-68-D-0819.
Continental Oil Co., Houston, Tex. \$3,033,225. 765,000 barrels of diesel marine fuel oil. DSA 600-68-D-0812.
Union Oil Co., Los Angeles, Calif. \$1,055,000. 700,000 barrels of #6 fuel oil. DSA 600-68-D-0015.
5—Plastoid Corp., Hamburg, N.J. \$2,272,899. 43,738 reels of telephone field wire. Defense Industrial Supply Center, Philadelphia, Pa. DSA 600-68-C-0160.
12—International Harvester Co., Melrose Park, Ill. \$1,398,466. Fifty tractors. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-8323.
16—Gulf Oil Corp., Houston, Tex. \$4,123,939. 12,702,000 gallons of gasoline; 13,713,000 gallons of fuel oil; and 4,545,000 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1045.
—American Oil Co., Chicago, Ill. \$1,890,408. 11,615,000 gallons of gasoline; 91,000 gallons of fuel oil; and 1,000,000 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1027.
—Cavaller Bag Co., Lumberton, N.C. \$4,201,500. 23,500,000 osnaburg sand bags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-3108.
—Consolidated, Inc., Philadelphia, Pa. \$2,550,940. 14,350,000 osnaburg sand bags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-3100.
18—Union Oil Co., Los Angeles, Calif. \$9,330,150. 919,000 barrels of diesel fuel and 1,405,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0823.
—Atlantic Richfield Co., Los Angeles, Calif. \$1,635,170. 81,000 barrels of diesel fuel and 500,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0811.
—Golden Eagle Refining Co., Los Angeles, Calif. \$1,504,000. 800,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0816.
—U.S. Steel, New York, N.Y. \$1,810,285. 138,478 spools of barbed wire. Defense

- Construction Supply Center, Columbus, Ohio, DSA 700-68-C-3608.
- C. F. and I. Steel Corp., Denver, Colo. \$1,228,170. 117,000 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio, DSA 700-68-C-3604.
- 19—Harnischfeger Corp., Milwaukee, Wis. \$1,134,419. 26 truck-mounted cranes with various attachments. Defense Construction Supply Center, Columbus, Ohio, DSA 700-68-C-8494.
- 20—Royal Lubricants Co., Hanover, N.J. \$2,728,166. 760,396 gallons of synthetic jet turbine lube oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-C-0006.
- 21—Riegel Textile Corp., New York, N.Y. \$1,052,480. 8,700,000 linear yds of wind-resistant poplin cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1180.
- 22—American Cyanamid Co., Princeton, N.J. \$1,240,727. 3,555 drums of insecticide. Defense General Supply Center, Richmond, Va. DSA 400-68-C-2804.
- 23—Bibb Mfg. Co., Macon, Ga. \$2,307,000. 630,000 linear yards of polyamide, high temperature resistant herring-bone twill cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1157.
- 24—Outboard Marine Corp., Waukegan, Ill. \$1,686,376. 1,200 centrifugal pumps. Defense Construction Supply Center, Columbus, Ohio, DSA 700-67-C-H-155.



DEPARTMENT OF THE ARMY

- 1—McDonnell Douglas Corp., Santa Monica, Calif. \$7,000,000. Development and conduct of experiments on techniques for guidance and control of anti-ballistic missile defense interceptors. Army Missile Command, Huntsville, Ala.
- AVCO Corp., Stratford, Conn. \$9,068,190. Combustion chamber assemblies for UH-1 helicopter engines. Aviation Materiel Command, St. Louis, Mo. AF-41008-67-A324.
- Institute for Defense Analyses, Arlington, Va. \$3,900,000. Research and analyses of space science, ballistic missile defense, equipment, and facilities to achieve military and scientific capabilities. \$2,772,000. Evaluation and operational analyses for the Joint Chiefs of Staff and Dir., Defense Research and Engineering. Defense Supply Service, Washington, D.C. DA HG-15-67-CQ011 and DA HIC15-67-C-0012.
- General Motors, Ypsilanti, Mich. \$3,738,750. 20mm automatic guns and components mounted on aircraft. Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0063.
- Rulon Co., Chicago, Ill. \$1,031,850. Sub-components of the M1 delay plunger for the M657 artillery fuse. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0198.
- Firestone Tire & Rubber Co., Akron, Ohio. \$1,417,525. Track shoe assemblies for M60 tanks. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1477.
- Rohm & Hass Co., Philadelphia, Pa. \$1,260,000. Propellant research. Huntsville, Ala. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0381.
- Pace Corp., Memphis, Tenn. \$1,160,000. Flares. Memphis, Tenn.; Russell Ark.; and Camden, Ark. Pleatiny Arsenal, Dover, N.J. DA-AA21-68-C-0497.
- 4—Bell Helicopter Co., Fort Worth, Tex. \$3,488,859. Rudder rotor blades for UH-1 helicopters. \$3,604,887. Rotary wing blades for UH-1 helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ-01-67-A0014 D.O. 8479 and 3478.
- 5—Bendix Corp., Baltimore, Md. \$1,485,000. Shelters with AN/GRC-147 radio sets installed. Electronics Command, Philadelphia, Pa. DA AB 06-68-C-1718.
- FMC Corp., San Jose, Calif. \$1,547,656. Hawk loader transporters. Tank Automotive Command, Warren, Mich. DA AE-07-68-C-1092.
- Raytheon Co., Lexington, Mass. \$1,976,250. Metal parts for bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-68-C-0243.
- 6—Continental Motors, Mobile, Ala. \$4,000,000. Rebuilding and/or retrofit of multi-fuel engines for 6-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1093.
- Weatherhead Co., Cleveland, Ohio. \$1,492,050. Metal parts for 80mm HEAT projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0253.
- 7—Stan Flowers Co., Oakland, Calif. \$1,243,022. Carpentry and related work for period of Jan 1, 1968 through Dec 31, 1969. Western Area, Military Traffic Management and Terminal Service, Oakland, Calif. DA-HC-23-68-D0028.
- 8—LTV Electronics, Huntington, Ind. \$2,190,540. Lightweight man-packed radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0005.
- Wilkinson Mfg. Co., Fort Calhoun, Neb. \$1,399,005. Fin assemblies for 60mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0125.
- Northrop Corp., Needham Heights, Mass. \$1,024,860. Fin assemblies for 81mm mortar projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0251.
- Bowen McLaughlin-York Co., York, Pa. \$4,933,954. Supplies and services to convert M48A1 tanks to M48A3 configuration. Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0076.
- Eureka-Williams Corp., Bloomington, Ill. \$5,291,600. Metal parts for bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0256.
- Magnavox Co., Fort Wayne, Ind. \$1,235,300. Advanced development models of ultra reliable receiver transmitters. Electronics Command, Philadelphia, Pa. DA-AB07-68-C-0127.
- Johnson Corp., Bellevue, Ohio. \$2,321,701. Two-wheel cargo trailers and trailer chassis. Tank Automotive Command, Warren, Mich. DA-AE0-68-C-0920.
- Liton Industries, Van Nuys, Calif. \$6,300,000. Tactical Fire Direction. Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0154.
- 11—National Union Electric Co., Bloomington, Ill. \$3,318,900. Metal parts for mechanical time fuzes for bomblet dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-67-C-0106.
- U.S. Steel, Pittsburgh, Pa. \$1,063,675. Metal parts for 8-inch projectiles. Berwick, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0207.
- 12—McGraw Edison Co., Bristol, Conn. \$4,233,664. Time fuzes for artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA08-68-C-0224.
- U.S. Steel, Pittsburgh, Pa. \$3,434,200. Metal parts for 8-inch projectiles. Berwick, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0270.
- 13—TRW, Inc., Washington, D.C. \$3,229,000. Continuation of design, development and interim operation of the Integrated Technical Data System for the Cheyenne Project. Harry Diamond Laboratories, Washington, D.C. DA-49-186-AMC-C-0324.
- Texas Instruments, Dallas, Tex. \$2,500,000. Infrared detecting sets. Procurement Div., Fort Monmouth, N.J. DA-AB07-68-C-0187.
- AVCO Corp., Richmond, Ind. \$1,238,400. Metal parts for adapter boosters for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-68-C-0121.
- 14—United Aircraft, Stratford, Conn. \$17,400,000. CH-64A helicopters, a main transmission test stand, and engineering and technical data. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-0793.
- 15—National Presto Industries, Eau Claire, Wis. \$20,987,140. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0065.
- AlResearch Mfg. Co., Phoenix, Ariz. \$10,400,950. Medical unit self-contained transportable components. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-3858.
- General Electric, Burlington, Vt. \$4,470,440. 7.62mm aircraft machine guns, spare parts and ancillary equipment. Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0014.
- Harvey Aluminum, Inc., Torrance, Calif. \$1,760,187. 40mm cartridge cases. Southwest Procurement Agency, Pasadena, Calif. DA-AG07-68-C-0663.
- Levinson Steel Co., Pittsburgh, Pa. \$1,233,500. Reactivation and repair of Government owned facilities at Hays Army Ammunition Plant, Pittsburgh, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0154.
- 18—Cadillac Gage Co., Warren, Mich. \$1,343,000. 70 light armored cars. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0397.
- Woodland Container Co., Altin, Minn. \$1,212,478. Wood packing crates for mine canister kits. Staples, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0265.
- Honeywell, Inc., North Hopkins, Minn. \$1,090,980. Bomb dispensers. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-08-C-0267.
- Northrop Carolina, Inc., Asheville, N.C. \$1,191,000. 300,000 lbs. of slot control agent, CS-1. Army Arsenal, Edgewood, Md. AA-15-68-C-0297.
- Aberthaw Construction, Boston, Mass. \$10,037,000. Construction of a high rise laboratory and auditorium and a center support building at the NASA Electronic Research Center, Cambridge, Mass. New England Div., Army Corps of Engineers, Waltham, Mass. DA-CA-33-68-C-0004.
- 19—R. C. Can Co., Hazelwood, Mo. \$1,605,573. Fiber ammunition containers for 81mm mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0200.
- Atwood Vacuum Machine Co., Rockford, Ill. \$2,550,010. M12 links for 20mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0348.
- Teledyne, Inc., El Monte, Calif. \$1,492,310. M12 links for 20mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA-AA-68-C-0849.
- R. McMullan & Sons, Honolulu, Hawaii. \$2,094,770. Alteration and improvements to 12 three-story barracks at Schofield Barracks, Hawaii. Engineer Dist., Honolulu, Hawaii.
- 20—Sperry Rand Corp., New York, N.Y. \$4,324,978. Miscellaneous major caliber items, mines and bomb fuzes. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC 00080.
- Hughes Aircraft, Fullerton, Calif. \$1,794,898. Industrial engineering services in support of air defense control and coordination system AN/TSG-51. Army Missile Command, Huntsville, Ala. DA-01-021-AMC-15600 (Z).
- Jacks-Evans Mfg. Co., St. Louis, Mo. \$1,761,278. 7.62mm cartridge links. Frankford Arsenal, Philadelphia, Pa. DA-AA-25-67-C-0518.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$3,609,311. OV-1 Mohawk helicopters and related services. Stewart, Fla., Calverton and Bethpage, N.Y. Aviation Materiel Command, St. Louis, Mo. DA-AJ-01-68-C-0190.
- 21—Honeywell, Inc., Hopkins, Minn. \$1,182,000. Research and development of ammunition. Pleatiny Arsenal, Dover, N.J. DA-AA21-68-C-0353.
- Stevens Mfg. Co., Ebensburg, Pa. \$2,048,863. 3/4-ton cargo trailers. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0978.
- Brads Machine Products, Gadsden, Ala. \$7,324,800. Booster metal parts loaded with detonators. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0209.
- Action Mfg. Co., Philadelphia, Pa. \$1,022,900. Rocket fuzes, metal parts M412. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0271.
- 22—University of Wisconsin, Madison, Wis. \$1,300,000. Advice and assistance in solving mathematical problems. Army Research Office, Durham, N.C. DA-31-124-ARO-D462.
- Dirlyte Company of America, Kokomo, Ind. \$1,227,000. Fin blades for 2.75-inch

- rockets. Pientinny Arsenal, Dover, N.J. DA-AA21-68-C-0529.
- F.T.S. Corp., Denver, Colo. \$1,143,110. Fin blades for 2.75-inch rockets. Pientinny Arsenal Dover, N.J. DA-AA21-68-C-0528.
- Emerson Electric Co., St. Louis, Mo. \$2,067,187. Aircraft armament subsystems (XM28) Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0038.
- Pace Corp., Memphis, Tenn. \$2,093,675. Ground illuminating signals. Pientinny Arsenal, Dover, N.J. DA-AA21-68-C-0453.
- Chrysler Corp., Warren, Mich. \$3,844,072. M60A1E1 turret systems for M60 tanks, repair parts, periscopes and range cards. Warren, Mich.; Scanton, Pa.; Dayton, Ohio; Huntsville, Ala. and Centerville, Mich. Army Weapons Command, Rock Island, Ill. DA-11-199-AMC-602 (W).
- Firestone Tire & Rubber Co., Akron, Ohio. \$1,382,667. T136 track shoe assemblies. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1158.
- General Time Corp., Stamford, Conn. \$3,667,110. Mechanical time fuzes for artillery ammunition. Thomaston, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0229.
- Kemmons-Wilson, Inc. and South and Patton, Memphis, Tenn. \$5,943,652. 250 housing units with supporting facilities at Howard AFB, Canal Zone. Engineer Dist., Jacksonville, Fla. DA-CA17-68-C-0027.
- Southern Airways Co., Atlanta, Ga. \$16,999,300. Metal parts for 165mm projectiles. Sylacauga, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0277.
- Boeing Co., Morton, Pa. \$2,453,874. Identification and fabrication of prototypes of ground support equipment and special tools for CH-47 Chinook Helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-1020 (M).
- E. I. DuPont, Wilmington, Del. \$1,724,250. T.N.T. Barksdale, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-085 (A).
- Cleveland Container Corp., New York, N.Y. \$1,702,107. Containers for 81mm mortar ammunition. Memphis, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0276.
- Ford Motors, Dearborn, Mich. \$1,237,000. Engineering services for M60 five-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0446.
- Leece Neville Co., Cleveland, Ohio. \$1,718,280. Generator assemblies for personnel carriers (M113). Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0592.
- Kennedy Van Saun Corp., Danville, Pa. \$1,534,000. Metal parts for 165mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0100.
- Harvey Aluminum, Inc., Torrance, Calif. \$2,665,000. Metal parts for 20mm projectiles. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0363.
- Union Carbide, New York, N.Y. \$3,057,262. Dry batteries for radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2172.
- Clevite Corp., Freeport, Ill. \$1,189,065. Dry batteries. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2169.
- Honeywell, Inc., Hopkins, Minn. \$6,345,298. Grenade fuzes. \$6,483,666. XM219 grenade fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0255 and DA-AA09-68-C-0282.
- Bulova Watch Co., Jackson Heights, N.Y. \$2,656,040. Metal parts for fuzes. Valley Stream, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0283.
- Western Electric, New York, N.Y. \$12,053,399. Planning activities on the Sentinel system and increased pre-production engineering and manufacturing preparation. Redstone Arsenal, Huntsville, Ala. DA-AA16-67-C-0205.
- Philco-Ford Corp., Newport Beach, Calif. \$2,260,000. Chaparral missile system components. \$4,460,478. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0548; \$4,460,478. Engineering services for FY 1968 for the Chaparral system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1024; \$1,476,000. 40mm grenade launchers for AH-1G Cobra helicopters. Southwest Procurement Agency, Pasadena, Calif. DA-AG07-68-C-00740.
- Allison Steel Mfg. Co., Phoenix, Ariz. \$1,984,000. Aluminum bridges (60-foot span). Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-4304.
- LaPointe Industries, Rockville, Conn. \$1,169,274. AS-1729/VRC base mounted antennae. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0009.
- Mine Safety Appliance Co., Pittsburgh, Pa. \$3,728,233. Field masks. Esmond, R.I. Army Arsenal, Edgewood, Md. DA-AA15-67-C-0265.
- Martin-Marietta Corp., Orlando, Fla. \$1,009,230. Product improvement for selected items of Pershing missile equipment. DA-AH01-68-C-0392; \$4,721,733. Shillelagh missiles DA-01-021-AMC-14200 (Z); \$12,714,086. Shillelagh missiles. DA-AH01-68-C-1020. Army Missile Command, Huntsville, Ala.
- General Dynamics, Pomona, Calif. \$32,428,390. Redeye missiles. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0274.
- Atlantic Research Corp., Alexandria, Va. \$6,654,236. Propellant loading of Redeye missiles. Gainesville, Va. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0913.
- Hughes Aircraft, Culver City, Calif. \$5,060,000. Industrial engineering services for the TOW weapon system for FY 1968. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0272.
- Hayes International Corp., Huntsville, Ala. \$1,471,500. Hardware and documentation for general transfer and reference sets for the Meteorology Calibration Center. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0990.
- Alisco, Inc., St. Louis, Mo. \$1,158,420. 2.75-inch rocket launchers. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1020.
- General Electric, Syracuse, N.Y. \$1,018,440. Installation of DAMWO Nike Hercules modification kits. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1001.
- General Motors, Detroit, Mich. \$23,123,850. Metal parts for 165mm projectiles. St. Louis, Mo. DA-AA09-68-C-0000; \$9,443,840. Body and band assemblies for 81mm cartridge projectiles. Warren, Mich. and Saginaw, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill.
- Atlantic Research Corp., West Hanover, Mass. \$2,976,002. Assembly of openers for the Tactical Fighter Dispensing Munitions Program. DA-AA09-67-C-0280. \$1,173,580. Loading assemblies for 60mm projectiles. DA-11-173-AMC 990(A). Ammunition Procurement & Supply Agency, Joliet, Ill.
- Day & Zimmerman, Inc., Philadelphia, Pa. \$37,492,815. Loading, assembling and packing medium caliber projectiles and for maintenance and support services. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-114 (A).
- Thiokol Chemical Corp., Bristol, Pa. \$28,810,685. Loading, assembling and packing various ordnance items and for maintenance and support services. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-200 (A).
- U.S. Time Corp., Waterbury, Conn. \$7,000,000. Fuzes for artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0289.
- Mason & Hanger-Silas Mason Co., Lexington, Ky. \$5,356,478. Loading, assembling and packing of miscellaneous items, medium and major caliber projectiles and related components. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00985 (A).
- Baldwin Electronics, Little Rock, Ark. \$1,603,072. Opener assemblies for the TPFDM program. Camden, Ark. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0326.
- Fusion Rubbermaid Corp., Statesville, N.C. \$1,389,040. Plastic canisters for the TPFDM program. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0329.
- Nash-Hammond, Inc., City of Industry, Calif. \$1,205,085. Plastic canisters for the TPFDM program. Ammunition Procure-

- ment & Supply Agency, Joliet, Ill. DA-AA09-67-C-0330.
- Chrysler Corp., Centerline, Mich. \$3,347,646. Engineering services in support of vehicles related to the M48 and M60 series of tanks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5044.
- Kaiser Jeep Corp., Toledo, Ohio. \$1,089,898. M600 utility trucks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5411.
- Amron Corp., Waukesha, Wis. \$5,365,050. 20mm brass cartridge cases. DA-AA25-68-C-0300; \$1,762,650. 20mm brass cartridge cases. DA-AA25-67-C-0400. Frankford Arsenal, Philadelphia, Pa.
- General Electric, Burlington, Vt. \$5,956,000. 20mm air defense artillery guns for the AM163 weapons system. Procurement Detachment, New York, N.Y. DA-AG25-68-C-0866.
- Boeing Co., Morton, Pa. \$1,400,000. Technical publication for CH-47A, B and G model helicopters to include operating and maintenance instructions, overhaul work requirements, vendor overhaul data, and avionics publications. Avionics Materiel Command, St. Louis, Mo. DA-AJ01-68-C-0069 (M).
- Magnavox Co., Urbana, Ill. \$1,400,000. Fuzes for the Redeye missile. Pientinny Arsenal, Dover, N.J. DA-AA21-68-C-0307.
- Sperry Rand Corp., Phoenix, Ariz. \$1,260,418. Aircraft compass magnetic radio indicators and electronic control amplifiers. Southwest Procurement Agency, Pasadena, Calif. DA-AG07-68-C-0711.



DEPARTMENT OF THE NAVY

- John C. Grimberg Co., and Sealand, Co., Rockville, Md. \$1,310,000. Installation of central heating, air conditioning and utility distribution at Bolling AFB, Washington, D.C. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. N3Y-66240.
- Kollmorgen Corp., Holyoke, Mass. \$2,593,770. Periscopes, adapters, repair parts and associated services. Northampton, Mass. Naval Ship Systems Command. N00024-68-C-5179.
- Lockheed Aircraft, Burbank, Calif. \$12,900,000. Change of P-3B aircraft to YP-3C configuration, plus associated material and services. Naval Air Systems Command. N00019-68-C-0043.
- Otis Elevator Co., Brooklyn, N.Y. \$2,834,502. Sonobuoys. Naval Air Systems Command. N0W-66-0661.
- M.I.T., Cambridge, Mass. \$1,800,000. Guidance tactical engineering support for the Polaris Missile. Special Projects Office. N00030-68-C-0164.
- General Dynamics, San Diego, Calif. \$1,584,000. Tracking radar. Naval Air Systems Command. N00019-67-C-0131.
- Thomas J. Doyle, Ltd., Calif. \$1,395,675. Construction of a maintenance dock, large aircraft fuel cell at Travis AFB, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NYU-81054.
- General Electric, Utica, N.Y. \$2,797,604. Airborne data processing systems. Naval Air Systems Command. N00010-67-C-0244.
- Ingersoll Shipbuilding Co., Pascagoula, Miss. \$4,000,000. Construction work on the nuclear powered attack submarine USS Pogy (SSN-647). Naval Ship Systems Command. N00024-68-C-0282.
- Nelrema Operating Co., Baltimore, Md. \$1,387,057. Stowage services to be performed at the Naval Air Station, Norfolk, Va. Naval Supply Center, Norfolk, Va. N00189-68-C-0313.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$21,000,000. EA-6A air-

- craft. Naval Air Systems Command N00019-67-C-0200.
- Marinette Marine Corp., Marinette, Wis \$6,860,000. Construction of eight landing craft utility (LCU) Naval Ship Systems Command, N00024-68-C-0254
- Raytheon Co., Lexington, Mass. \$3,880,207. Sparrow III guided missiles, Lowell, Mass., Bristol, Tenn and Oxnard, Calif Naval Air Systems Command. NOV 66-0149.
- Marinette Marine Corp., Marinette, Wis \$3,398,096 Construction of 104 landing craft, personnel, large (LCP(1)) Naval Ship Systems Command N00021-68-C-0206.
- Harbor Boat Building Co., Terminal Island, Calif \$1,166,611. Regular overhaul of the minesweepers USS Constant and USS Energy. Supervisor of Shipbuilding, Eleventh Naval Dist., Long Beach, Calif. N62791-68-B-0052.
- Sperry Gyroscope Co., Great Neck, N.Y. \$1,000,000 Modification kits for radar sets Headquarters, Marine Corps.
- 11—General Dynamics, Pomona, Calif. \$6,700,000. Increase of limitation for authorization of production for Standard missiles (medium range), Naval Ordnance Systems Command N00017-67-C-0047.
- Honeywell, Inc., North Hopkins, Minn. \$1,074,603. Production of ignition separation assemblies and igniters for the Asroc missile Sausages, Calif. Naval Ordnance Systems Command, N00017-67-C-1103.
- 12—LTV Aerospace Corp., Dallas, Tex. \$22,551,482. A-7E aircraft. Naval Air Systems Command. N00019-68-C-0075.
- Sanders Associates, Nashua, N.H. \$2,162,424. Classified Electronics Equipment. Naval Air Systems Command. N00010-67-C-0562.
- Honeywell, Inc., West Covina, Calif \$1,386,497. Production of Asroc depth charge adaptation kits Naval Ordnance Systems Command N00017-67-C-1120.
- 13—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$32,500,000. Incorporation of general purpose computers in E2A aircraft. Naval Air Systems Command. N00019 67-C-0657.
- Lifton Systems, Silver Spring, Md. \$1,675,841. Radar altimeter receiver transmitters. Aviation Supply Office, Philadelphia, Pa. N00383-67-C-0461.
- King-Hunter, Inc., Greensboro, N.C. \$1,263,591. Construction of a BQQ and a mess addition at Marine Corps Air Facility, Jacksonville, N.C. Atlantic Div., Naval Facilities Engineering Command.
- Philco-Ford Corp., Fort Washington, Pa \$1,261,002 Professional technical engineering effort to instruct and train Navy personnel in the assembly and repair of Navy radar, sonar, and communications equipment. Naval Ship Systems Command. N00024-68-C-1060.
- 14—Hughes Aircraft, Culver City, Calif. \$1,496,428. Work on rocket motors for the Phoenix missile. Naval Air Systems Command. N00019-67-C-0178.
- Talley Industries, Mead, Ariz. \$1,073,781. MK II, MOD I, impulse cartridges used to activate ejection release of bombs and canisters. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68 C-3341.
- 15—General Electric, Schenectady, N.Y. \$32,064,900. Design and furnish Navy nuclear propulsion components. Naval Ship Systems Command. N00024-67-C 5056
- TRW Systems, Washington, D.C. \$10,000,000. Systems analysis, integration analysis, engineering support, technical management support and engineering laboratory experimentation for an ASW systems Project. Naval Ordnance Systems Command. N00017-68-C-1305.
- LTV Aerospace Corp., Dallas, Tex. \$8,100,000. A-7D aircraft. Naval Air Systems Command. N00019-67-C-0143.
- PRD Electronics, Westbury, N.Y. \$2,447,517. Versatile Avionics Shop Test systems and associated ancillary items. Naval Air Systems Command. N00019-67-C-0484.
- Brewer Dry Dock Co., Staten Island, N.Y. \$1,008,000. Activation and overhaul of the high speed transport USS Bassett (APD-73). Supervisor of Shipbuilding, Fourth Naval Dist., Camden, N.J. IPB 62787-10006-68.
- 18—Bainfield Industries, Dallas, Tex. \$28,539,430. MK 15, MOD 1 air assemblies for Snakeye missiles, Shreveport, La. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-8384.
- Teledyne, Inc., Berwick, La. \$3,408,408. Construction of 22 fifty-foot aluminum hulled patrol craft Naval Ship Systems Command. N00024-68-C-0283.
- Lasko Metal Products, West Chester, Pa \$2,959,318 L.A.V-10A rocket launchers for Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa N104-68-C-3364.
- American Mfg. Co. of Tex., Fort Worth, Tex. \$1,782,300 MK 41, MOD 0 projectiles for 6-inch 64 cal. ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa N00104-68-C-3371.
- Worldwide Moving & Storage, Inc., Honolulu, Hawaii. \$1,169,229. Packing and crating of household goods. Naval Supply Center, Pearl Harbor, Hawaii. N00604 68-C-0232.
- 10—Williams & Burroughs, Inc., Belmont, Calif \$3,124,700. Construction of barracks at Treasure Island Naval Station, Calif. Western Div., Naval Facilities Engineering Command.
- RCA, Van Nuys, Calif. \$1,250,000 Radio frequency oscillators, repair parts and technical data. N00024-68-C-1119. \$1,249,797. Radio frequency amplifiers, repair parts, associated test equipment and technical data. N00024-68-C-1118. Naval Ship Systems Command
- Meadow Gold Dairies, Honolulu, Hawaii \$1,034,546. Dairy products for use in Navy messes for period Jan. 25, 1968 through July 24, 1968. Naval Supply Center, Pearl Harbor, Hawaii. N00604-68-C-0243.
- 20—General Dynamics, Pomona, Calif. \$8,700,000. Airborne avionics equipment for use with Standard Arm missiles Naval Air Systems Command. N00019-68-C-0074.
- Western Electric, New York, N.Y. \$5,415,826. Oceanographic research. Whilpany, N.J. Naval Electronic Systems Command. N00030-68-C-3584.
- ESB, Inc., Philadelphia, Pa. \$4,541,004. Submarine battery cells and elements. Naval Ship Systems Command N00024-68-C 6210.
- Curtiss Wright Corp., Wood-Ridge, N.J. \$4,001,261. Installation of parts and spares in support of J-65-W20 engines for A-4G aircraft. Aviation Supply Office, Philadelphia, Pa. F41608-67-A-6900-GB128.
- General Motors, Indianapolis, Ind. \$3,978,700. Modification kits for T-56-A-16 engines for C-130 aircraft. F34601-67-A-1694GBGM.
- Raymond Engineering, Inc., Middletown, Conn. \$2,709,000. MK 93 fuze assemblies for 6-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68 C-0880.
- Gould-National Batteries, St. Paul, Minn. \$1,780,168 Submarine batteries and spares. Kankakee, Ill. and Trenton, N.J. Naval Ship Systems Command N00024-68 C-5211.
- 21—Goodyear Aerospace Corp., Akron, Ohio. \$4,850,000. Production of Subroc missiles. Naval Ordnance Systems Command. N00017-68-C-1408.
- General Electric, Schenectady, N.Y. \$3,064,000. Nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-6014.
- Carrier Corp., Syracuse, N.Y. \$2,047,609. Non-magnetic 25-ton air conditioning units for installation in ships. Naval Ship Systems Command. N00024-68-C-5119.
- 22—American Machine & Foundry Co., York, Pa. \$10,247,777. 600-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0715.
- Borg Warner Corp., Chicago, Ill. \$5,136,016. 250-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3418.
- Northrop Corp., Palos Verdes Peninsula, Calif. \$2,079,927. Systems engineering support of the deep submergence program. Naval Ship Systems Command. N00024-68-C-0216.
- Westinghouse Electric, Pittsburgh, Pa \$1,709,674. Design and furnish Navy nuclear propulsion components. Naval Ship Systems Command. NOB 04528.
- General Electric, Santa Barbara, Calif. \$1,876,519. Research on Fleet ASW data analyses. Office of Naval Research. N0NR 4781 (00).
- Walter Kidde & Co., Belleville, N.J. \$1,685,005. Airborne armament maintenance trailers. Naval Air Engineering Center, Philadelphia, Pa. N00150-68-C-1155.
- 26—Grumman Aircraft Engineering Corp.,
- Bethpage, N.Y. \$65,900,000. A-6A aircraft. N00019-68-C-0106. \$32,391,997. EA-6B aircraft. N00019-67-C-0078. Naval Air Systems Command
- Westinghouse Electric, Baltimore, Md. \$3,950,000. Airborne radar sets Naval Air Systems Command N00019-67-C-0173
- LTV ElectroSystems, Inc., Greenville, Tex. \$1,177,268. Modification of EC-121 aircraft. Naval Air Systems Command Nov 66-0258-f
- Lockheed Missiles & Space Co., Sunnyvale, Calif \$37,250,465. Polaris Missile modification kits Special Projects Office. N00030-67-C 0177
- R.C.A., Camden, N.J. \$7,471,250. Design and development of a shipboard interfor communication system, technical data, and engineering services. Naval Ship Systems Command 67-C-5547
- Texas Dynatronics Co., Dallas, Tex \$2,301,632. Head details used on 5-inch spinner rockets Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3406.
- Scope, Inc., Reston, Va. \$1,306,750. Classified electronics equipment Falls Church, Va Naval Ship Systems Command. N00024-67-C-1481
- Marquardt Corp., Van Nuys, Calif. \$1,298,658. Exploratory development of an advanced fueling rocket system for air-launched missile applications. Naval Ordnance Station, Indian Head, Md N00174-68 C-0222.
- 28—Lockheed Aircraft, Burbank, Calif. \$10,431,979. Procurement of P-3B aircraft. Naval Air Systems Command. N00019-67-C 0067.
- Harvard Industries, Farmingdale, N.Y. \$8,867,070. Production of a basic point defense surface missile system Naval Ordnance Systems Command.
- Westinghouse Electric, Pittsburgh, Pa. \$3,860,000. Design and furnish nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5177.
- Motorola, Inc., Chicago, Ill. \$1,876,416. Range azimuth indicators, repair parts, and engineering services. Naval Ship Systems Command N00024-C-1036.
- Fishback & Moore, Inc., Dallas, Tex. \$1,247,742. Procurement & installation of electronic equipment at the Naval Radio Station, Sugar Grove, W. Va. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. NBY 01882.
- 20—Conduction Corp., Pomona, Calif. \$1,158,174. Device 151112, a part task trainer to be used in training of Marine personnel in the operation of the sensor systems, Electronic Warfare Equipment and Communications Equipment aboard RF-4B aircraft. Naval Training Device Center, Orlando, Fla. N61330-68-C-0090.



DEPARTMENT OF THE AIR FORCE

- 1—Fairchild Hiller, Farmingdale, N.Y. \$1,026,666. Installation of emergency flight control system kits for F-106 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. AF 34601-67-A-3070.
- 2—Collins Radio Co., Cedar Rapids, Iowa. \$3,127,642. Production of communication equipment for F-111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33057-67-C-0605-P002.
- 6—Koehring Co., Springfield, Ohio. \$1,454,900. Production of aircraft cargo loading/unloading trucks. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF P09603-67-C-3063-P002.
- ITT Gilfillan, Inc., Los Angeles, Calif. \$6,335,813. Production of ground radar systems. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34601-68-C-1762C.
- Electro-Mechanical Corp., Sayre, Pa. \$2,430,000. Design and furnish nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5177.

- 230,413. Manufacture of expandable shelters. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F-33657-68-C-0507.
- McDonnell Douglas Corp., Huntington Beach, Calif. \$1,808,084. Production of miscellaneous hardware components for Genie rockets. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF F-04606-67-A-1431-QP02.
- Cullman Metalcraft, Inc., Cullman, Ala. \$1,269,604. Production of aircraft ordnance. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F-33657-68-C-0624.
- 7—Systems Development Corp., Santa Monica, Calif. \$7,041,800. Computer programming services for satellite control facilities. Air Force Satellite Control Facility, Los Angeles, Calif. F04701-68-C-0103.
- Philco-Ford, Philadelphia, Pa. \$3,477,676. Fabrication, repair and modification of air-to-air missiles and components. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
- Chromalloy American Corp., New York, N.Y. \$1,292,000. Repair of J-57 and J-75 aircraft engines. West Nyack, N.Y. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-67-D-7444-0003.
- Sanders Associates, Bedford, Mass. \$3,148,687. Production of airborne ordnance fuzes. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0658.
- Whittaker Corp., Chatsworth, Calif. \$1,879,381. Manufacture of airborne electronics components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0671.
- R. G. Webb, Inc., and Barney Wilkerson Construction, Riverside, Calif. \$2,464,000. Construction of 150 family housing units at Cannon AFB, N.M. Procurement Div., 832nd Combat Support Group, Cannon AFB, N.M. F29605-68-C-0040.
- 8—Aveco Corp., Stratford, Conn. \$10,123,500. Production of ballistic missile penetration aids. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F 04605-67-C-0148.
- Radiation, Inc., Melbourne, Fla. \$2,693,753. Production and installation of telemetry and communication systems for the United Kingdom. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04605-67-C-0148.
- Boeing Co., Seattle, Wash. \$1,500,000. Modification of the second stage of a launch vehicle (burner II upper stage). Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04606-67-C-0134.
- Canadian Commercial Corp., Ottawa, Ontario, Canada. \$1,702,299. Spare parts for R 4360 aircraft engines. Longueville, Quebec, Canada. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
- 11—Hazeltime Corp., Little Neck, N.Y. \$2,547,072. Production of airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F33657-67-C-1025 P001.
- 12—Martin Marietta, Denver, Colo. \$4,392,994. Design, development, fabrication and delivery of Titan III space boosters. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04(695) 150.
- McDonnell Douglas Corp., Long Beach, Calif. \$1,414,954. Production of components for fighter aircraft bomb racks. Torrance, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 04606-67-A-1432.
- 14—General Motors, Indianapolis, Ind. \$13,366,126. Production of T-56 aircraft engines and support equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1335.
- Aerodex, Inc., Miami, Fla. \$2,079,641. Overhaul of J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 41608-67-C-2200.
- Planning Research Corp., Los Angeles, Calif. \$1,128,000. Engineering research services on computer programming. Rome Air Development Center, Griffiss AFB, N.Y. AF 30802-68-C-0108.
- 15—Illinois Institute of Technology, Chicago, Ill. \$4,501,953. Operation of an electromagnetic compatibility analysis center. Annapolis, Md. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 10628-68-C-0130.
- Garrett Corp., Phoenix, Ariz. \$2,395,012. Production of gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34601-67-C-5385.
- 18—McDonnell Douglas Corp., St. Louis, Mo. \$1,984,200. Modification of airborne electronics equipment on F-4 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
- 19—Martin Marietta, Baltimore, Md. \$1,115,246. Modification of high frequency single band radios for F-101 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-1072.
- American Electric, La Mirada, Calif. \$12,597,812. Aircraft bombs. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-1713.
- United Aircraft, East Hartford, Conn. \$1,004,256. Spare parts for J-57 and TF-33 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
- Continental Aviation & Engineering Corp., Detroit, Mich. \$1,640,000. Component improvement program in support of J69 engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0887-P001.
- General Electric, Cincinnati, Ohio. \$50,799,500. Production of J79 jet engines for F-4 aircraft. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0074-P001.
- 22—General Electric, Cincinnati, Ohio. \$5,221,323. Production of J79 turbojet engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1016.
- Sylvania Electric Products, Needham Heights, Mass. \$3,736,770. Support of a ground electronics system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04604-67-C-0050-P048.
- American Electric, La Mirada, Calif. \$10,519,014. Production of bomb fuze assemblies. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-0230.
- 26—United Technology Center, Sunnyvale, Calif. \$5,000,000. Procurement of Titan III Manned Orbiting Laboratory long-lead hardware for solid rocket motors. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04(695)-1022.
- 27—General Electric, West Lynn, Mass. \$13,945,000. Production of helicopter engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1428.
- 28—Bendix Corp., Teterboro, N.J. \$2,674,305. Repair of two platform gyros. F34001-68-C-1435; \$3,896,732. Repair and/or modification of B-55 flight control systems. F 34601-68-D-1099. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
- 29—Western Electric, New York, N.Y. \$1,000,000. Operation and maintenance of ground guidance systems. Vandenberg AFB, Calif. and Burlington, N.C. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F 04701-68-C-0138.
- Sundstrand Aviation Corp., Rockford, Ill. \$1,620,000. Production of constant speed drive assemblies. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-2394.
- General Motors, Milwaukee, Wis. \$7,000,000. Work on the Titan III inertial guidance system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-70065.
- Riverside Research Institute, New York, N.Y. \$3,044,545. Research and development of the Ballistic Missile Defense Program. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass. F 10682-68-C-0084.
- 5—Litton Systems (Canada), Ltd., Rexdale, Ontario, Canada. \$1,809,308. Weapons release system (AN/ASQ-91) applicable to F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Navy Tests Chemical Light for Underwater Use

The Ocean Engineering Division of the Naval Missile Center, Point Mugu, Calif., has been experimenting with several chemical light sources for underwater use by the Navy.

Ocean engineers have packaged the most promising chemicals in a new plastic material and obtained sufficient light to read by for periods of one-half hour.

The chemical does not need air to produce light making it ideal for underwater. Five hours after the chemical has been activated it still gives off enough light to read a watch dial. Even after 48 hours, the chemical gives off enough light to serve as a marker on land.

In pool tests, the chemical was effective as an underwater marker at distances of over 100 feet.

The chemical also proves useful as a light source for underwater photography at distances of up to 15 feet.

AMC Manuals Symposium Set for March 19-20 in Washington, D.C.

An Equipment Manuals Symposium, co-sponsored by the U.S. Army Materiel Command and the National Security Industrial Association, will be held on March 19-20 at the Statler Hilton Hotel, in Washington, D.C.

The objective of this symposium is to bring into focus the necessity for more effective manuals. It is intended to identify problems facing the user of equipment manuals and to present solutions for improving their effectiveness. A better understanding, within Government and industry, of interfacing activities, new techniques, methods and equipment should increase the effectiveness of equipment manuals.

For additional information, the contact is:

National Security Industrial Association
Attention: Department EM
1030 15th St. NW
Washington, D.C. 20005
Phone: (202) 296-2266

OFF-SHORE PROCUREMENT

OFFICIAL BUSINESS

Performance Measurement Criteria for Defense Contracts Issued by DOD

The Defense Department has issued the latest in a series of publications, developed by the Office of the Assistant Secretary of Defense (Comptroller), in connection with the Selected Acquisition Information and Management System (SAIMS), one of DOD's Resource Management Systems. The publication is DOD Instruction 7000.2, "Performance Measurement for Selected Acquisitions."

The new instruction on performance measurement is based on an approach initially taken by the Air Force. It is the ultimate product of more than two years of effort in DOD staff coordination and discussions with industry through the Council of Defense and Space Industries Association. Individual drafts, describing DOD interest in this approach, were circulated widely throughout defense industry on two separate occasions.

The stated objective of the instruction is to "bring to the attention of and encourage DOD contractors to accept and install management control systems and procedures which are most effective in meeting their requirements." A key feature of the instruction is the statement of a set of Cost/Schedule Control Systems Criteria which a contractor's management control system must meet, while providing surveillance over the accomplishment of the cost, schedule and technical requirements of the contract.

Provisions of the instruction are effective immediately. Implementation of the criteria will be contractual and applied to future defense contracts for major acquisitions. Assuring the effective and efficient use of resources is a major consideration of all defense

with the new instruction is an important
of these goals.

he service for obtaining DOD publications
is instruction, one copy per request, from:
ttention: Code 300, 5801 Tabor Avenue,

IDEP Workshop Scheduled For May 1968

The sixth National Workshop Conference of the Interagency Data Exchange Program (IDEP) is scheduled for May 1-3, at the Ambassador Hotel, Los Angeles, Calif.

The IDEP program is sponsored by the Army, Navy, Air Force and the National Aeronautics and Space Administration to avoid duplication of effort in the testing of parts and materials, and to standardize test planning, test procedures and test reporting. Approximately 200 military and space contractors are participating in the program.

The 1968 workshop conference will be co-hosted by North American Rockwell Corp. and the Air Force Systems Command's Space and Missile Systems Organization. Co-sponsors are the Contractors Advisory Board and the Army, Navy, Air Force and National Aeronautics and Space Administration IDEP Policy Board.

For further information and advance registration, the contact is: Peter Amedeo, Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y. 11714.



DEFENSE INDUSTRY BULLETIN

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ROBERT S. McNAMARA

Secretary of Defense McNamara's seventh and final statement to Congress on the FY 1969-73 Defense Program and the FY 1969 Defense Budget begins on page 2.

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Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor, Telephone queries: (202) OXford 5-2709.

The *Bulletin* is distributed without charge each month to representatives of industry and agencies of the Department of Defense, Army, Navy and Air Force. Subscription requests should be made in writing on letterhead and addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301.

Contents of the magazine may be reprinted freely without requesting permission. Mention of the source will be appreciated.

Clark M. Clifford

Appointed Secretary of Defense



FADIAN BACHRACH

Clark M. Clifford

President Lyndon B. Johnson has appointed Clark M. Clifford, 61, Secretary of Defense succeeding Robert S. McNamara. Mr. McNamara is assuming new duties as President of the World Bank.

Mr. Clifford has practiced law in Washington, D.C., since leaving Government service in 1950 and has served in an advisory capacity to President Johnson and President John F. Kennedy.

Born in Fort Scott, Kan., Dec. 25, 1906, Mr. Clifford was graduated by Washington University in St. Louis where he also obtained his law degree in 1928.

During World War II, he served in the U.S. Navy as special assistant to Commander, Western Sea Frontier; as assistant Naval Aide to the Presi-

dent and as Naval Aide to the President. He left the Navy in 1946 with the rank of captain.

From June 1946 to Feb. 1950, Mr. Clifford served as Special Counsel to President Harry S. Truman.

In 1945, President Truman assigned him the task of conducting a study in depth on the unification of the Armed Services. He worked with the War Department, the Navy Department, other departments and agencies involved, and the Congress for two years thereafter. The resulting passage of the National Security Act in 1947 was in part due to the work performed by Mr. Clifford, one of the principal architects of this legislation.

In 1949, he worked with the Secretary of Defense, other departments and the Congress on the passage of

the National Security Act Amendments of 1949, which strengthened the authority of the Secretary of Defense and changed the national military establishment into a regular executive Department of Defense.

Since 1960, he has served as a member of the Committee on the Defense Establishment, appointed by Senator John F. Kennedy to survey the organization, management and administration of the Defense Department; as a member of President Kennedy's Foreign Intelligence Advisory Board, becoming chairman of the board in April 1963; as adviser to President Johnson at the Manila Conference in 1966; and in 1967 he visited a number of Southeast Asian and Pacific countries as personal emissary of President Johnson.

Defense Budget Highlights

Approach to the FY 1969-73 Program and FY 1969 Budget

[Editor's Note: This issue of the Defense Industry Bulletin is devoted almost entirely to Secretary of Defense Robert S. McNamara's seventh and last statement presented on Feb. 1, 1968, before a joint session of the Senate Armed Services Committee and the Senate Subcommittee on Department of Defense Appropriations on the FY 1969-73 Defense Program and the 1969 Defense Budget.]

While space limitations permit only an abbreviated treatment of the statement, an attempt has been made to excerpt those portions which are of special interest to defense industry. Using the method established in previous years, paragraph markings have been deleted from the original text for the sake of clarity.]

This is the seventh and final Five Year Defense Program and Financial Budget it will be my privilege to present to this Committee. Since there are a number of important basic policy issues which warrant a more extensive discussion, I have dropped from this year's statement some of the usual program detail. However, other Defense Department witnesses will be available to go into these matters in whatever depth you may desire.

As has been my practice in the past, I will attempt to call your attention to the more important changes in the Defense Program which have occurred since last year, particularly those relating to our effort in Southeast Asia.

Last year when I appeared before this Committee in support of the FY 1968 Budget I said, "... barring a significant change in the character or scope of the Southeast Asia conflict, or unforeseen emergencies elsewhere in the world, the FY 1967 Supplemental and FY 1968 Budget should be sufficient to cover our re-

quirements until FY 1969 funds become available. . . ." A careful review of our financial requirements for the balance of FY 1968 has convinced me that we can still manage the program within the total obligational authority provided. However, to do so we will need authority to transfer a limited amount of funds among the various Defense Department appropriations. . . .

With regard to the FY 1969 Budget, I have again deleted all programs which can be safely deferred to a later time. In particular, our military construction request includes primarily those projects needed for support of our forces in Southeast Asia, for new weapon systems, and for the health and safety of our personnel. And, of course, we are continuing with undiminished vigor our cost reduction efforts.

. . . We are requesting for FY 1969 a total of \$79.6 billion in new obligational authority. Expenditures are now estimated at \$74.2 billion for FY 1968 (about \$500 million more on a comparable basis, i.e., taking account of pay raises and the new budget concepts, than was estimated one year ago and several billion less than some have predicted in recent months) and \$77.1 billion for FY 1969.

Assessment of the International Situation as It Bears on Military Policies and Programs

In the seven years since I first came before this Committee to testify on our defense programs, the military and economic strength of the United States and its allies has increased dramatically. But so have the difficulty and complexity of the

problems we have had to face in framing our military policies. These years have seen the acceleration of a number of trends which will make the world of the 1970s very different from the world of the early 1960s. Today, as then, our military posture remains rooted in a commitment to collective defense. We and our allies are demonstrating this commitment every day in Vietnam. But today, and tomorrow, our country must be prepared to cope with a complex range of contingencies requiring forces and weapon systems with very diverse capabilities.

Since the early 1960s the divisions within the camp of our adversaries, already apparent then, have both deepened and widened. Indeed, there are now not simply two centers of Communism but several: Havana shows little inclination to follow the lead of Moscow or Peking, and is itself trying to exert a lead over the splintered Communist movements of the developing world. In Moscow, we still detect a desire to undermine the institutions of many nations and the influence of the United States. But we find this desire tempered by a prudence powerfully reinforced by a justly held fear of nuclear war.

At the same time that we find ourselves engaged in a conflict with North Vietnam and its South Vietnamese supporters to preserve the principle that political change must not be brought about by externally directed violence and military force, we find ourselves engaged in many forms of peaceful competition with other Communist states. In the world of the late 1940s and early 1950s, when our adversary seemed monolithic, such a situation would have been unimaginable. Yet today it would be as shortsighted for us to fail to seek peaceful accommodation

(in those activities in which this may be possible) with the Soviet Union and its Eastern European allies as it would be for us to fail to maintain the credibility of our deterrent against Moscow's improved strategic systems—or to fail to resist aggression in Korea or Vietnam.

Thus, circumstances for which we must formulate our military policies have changed greatly from those of the early 1960s. But our goals remain the same. Fundamentally, what is at issue today—as it was a decade ago and as it will be a decade from now—is the kind of world in which we and others wish to live. When this nation made the decision at the end of World War II to base its own security on the principle of collective defense, it was with the hope that there could be created, in accordance with the principles of the United Nations Charter, a world in which even the smallest state could look forward to an independent existence, free to develop in its own way, unmolested by its neighbors, and free of fear of armed attack or political domination by the more powerful nations.

Some years later, in a world already familiar with the gap between Communist promise and Communist reality, and with Communist aggression as well, we sought to achieve this same high purpose by aligning ourselves with other like-minded nations in a series of multilateral and bilateral mutual defense treaties. By the close of 1955, this system of interlocking alliances had grown to include the Rio Treaty in the Western Hemisphere, NATO in Europe, SEATO and ANZUS in the Far East and bilateral mutual defense agreements with Korea, Japan, the Republic of China, and the Philippines—a total of some 40-odd sovereign nations bound together in an effort to defend their freedom and prevent the further extension of Communist influence and hegemony.

Looking back over the history of the last two decades, I believe it is fair to say that this system of alliances has substantially achieved its purpose. Although the record is less than perfect, the outward thrust of Soviet and Red Chinese aggression has been generally contained and the independence of even the smallest member of the alliances has been preserved. Beyond the immediate objective of these alliances, our adher-

ence to a policy of collective defense has helped us to pursue our ultimate goal—the creation of a world order in which all states, small and large, aligned and unaligned, can preserve their independence and live in peace.

Collective security, however, has had its price. The members of the alliances have had to support large and costly military forces for many years, with small prospect of an early reduction. Moreover, we, and some of our allies, have had to pay a particularly high price, both in lives and in wealth, for the alliances' achievements—first in Korea during the early 1950s and now again in Southeast Asia. So, the American people have a right to ask: Were these achievements worth their cost, particularly in terms of their ultimate contribution to the peace and security of our own nation?

I believe they were. But this is a question which can never be answered conclusively; there is no way by which we can determine with certainty what the world and this country would have looked like today had we not based our national security policy on the principle of collective defense during the last 20-odd years. However, we do know that the policies of unarmed isolationism and attempted neutrality, which we followed prior to World War II, were in the end far more costly in lives and property.

Moreover, it must be clearly recognized that, while it is conceivable that we could return to a policy of isolationism, today this could no longer be the unarmed isolationism of the 1930s. In an age of nuclear weapons and intercontinental ballistic missiles, when other nations have the capability to strike our homeland a devastating blow with perhaps only a few minutes of warning, such an easy option is denied us.

Nevertheless, one could argue that we could still renounce all of our mutual defense treaties, pull back our military forces to our own soil, and build a "Fortress America" so powerful as to deter virtually any enemy or combination of enemies from deliberately attacking our territory. Then we could deal with the rest of the world on a strictly arms-length basis. But that would be an entirely different world than the one we now live in—and an entirely different United States as well! With-

out dependable friends or allies, we would surely have to maintain a larger military establishment than at present. We would also have to reorient our industry and commerce to achieve a maximum degree of economic self-sufficiency with a lower standard of living for our people, and considerably less economic freedom for all. Most important, we would be living in a far more uncertain and dangerous world, one in which our influence over the course of events would be greatly diminished. It would also be a world in which the pressures for proliferation of nuclear weapons and the means of their delivery would be much stronger than they are today. In time, we could find ourselves literally isolated, a "Fortress America" still relatively prosperous, but surrounded by a sea of struggling, envious and unfriendly nations—a situation hardly calculated to strengthen our own state of peace and security. Isolationism is clearly an undesirable alternative to our continued involvement in the responsibilities of world affairs and collective defense. This does not mean, however, that we must assume the role of "world policeman." But it does mean that we must be willing to continue to support those international arrangements which help to preserve world peace, alleviate conflicts among nations, and create conditions for economic and social progress in the less developed areas of the world.

I would hope that our allies and friends will similarly recognize that the new international situation is too complicated and threatening for any sudden abandonment by them of the collective defense of freedom and independence. The principle that every nation should feel secure in its independence is still valid, and it cannot easily be ignored in one part of the world and sustained in another. The contribution of individual nations to this goal can take many forms, and there is admittedly no precise way to determine any nation's fair share of the burden. We, on our part, must recognize that some of our friends and allies simply do not have the economic strength or industrial capacity to equip and maintain the armed forces they legitimately need; in fact, a few cannot even meet their military payrolls from their

own resources. It is in the common interest that these nations be furnished the necessary financial and material support, not only by the United States, but also by the other more prosperous members of the alliances. There have been some encouraging moves in that direction, but too great a share is still being furnished by the United States.

Having said that other nations should do more in the common cause does not mean that I think we should do less, at least at the present time. The severe cuts made by the Congress last year in the Administration's economic and military aid request constitute a very serious setback to the entire collective defense effort. Moreover, the numerous limitations which were incorporated in the military aid legislation will seriously hamper the administration of the program and greatly complicate our relations with many of our allies. In this connection, I think it is of the utmost importance for us to remember that the non-Communist world is made up of sovereign states which have widely differing histories, capabilities, and political and economic orientations. Even where these states subscribe in principle to the policy of collective security, we should not expect that there will always be a unanimity of view as to how and by whom that policy should be implemented in any particular situation. Neither is it realistic for us to expect them all to share our scale of priorities. Each has its own particular set of local problems and national aspirations, and each will insist on judging for itself what is best for its people. We should, and do, try to guide them in areas where our joint interests are involved. And, we should, and do, try to ensure that what aid we give them is effectively used both from their point of view and ours. We do not, and should not, attempt to force our views upon them by unilateral coercion through trade and aid, for this is not the way to achieve the unity needed for the collective defense of the Free World.

However, I cannot help but feel that most of the restrictions and fund reductions imposed by the Congress on the national security program last year reflect a much more fundamental problem, and that is a growing unwillingness to face up to the fact that, if the policy of collective

defense is to work, we must be ready to pay our share of the price of supporting it. If this is so, I must tell you in all candor that our nation will be much better off if we confront the real issue directly, and that is whether we should continue to base our national security on the policy of collective defense. There is nothing to be gained and much to be lost by paying lip service to the policy, and then failing to support the programs designed for its implementation.

That the American people have become somewhat disillusioned and weary with the problems of the rest of the world is readily understandable: for many years we have borne a large share of the burden of world peace and security, and of assistance to the developing nations. But we must never forget that of all nations we have the most at stake. The existence of an open, outward-looking, humane society in the United States depends upon the vitality of similar societies elsewhere. We must also never forget that our burden is large because our capacity is large—so much larger, in fact, than that of any other nation as to make comparisons misleading. For better or for worse—hopefully, for better—we are preeminent, with all of the obligations which accrue to leadership. So despite the rapidly increasing complexity of the world of the late 1960s and the 1970s, and the difficult choices it will pose for us, we must not in weariness or disillusionment abandon our international role, or neglect to face up to the real implications of new and old alternatives.

For my part, I am convinced that we will judge the alternatives to a continued dedication to collective defense to be unacceptable. I am also convinced that embracing the obligations of leadership will not force us to divert badly needed resources from the improvement of American domestic society. Our resources are sufficient, if wisely allocated, to meet the needs of the weak and the underprivileged both at home and abroad. For the sake of our security and our well-being, we can afford no less.

* * * * *

Military Assistance and Sales

... In accord with the obvious sentiment of the Congress and the

changed priorities imposed by the budgetary demands of the Vietnam conflict, our proposed FY 1969 grant military assistance request has been held to the lowest level since the inception of this program in FY 1960.

First priority has again been accorded to the "forward defense" countries on the Communists periphery. Programs have been deferred to the maximum extent feasible, and in some cases the amounts we propose for FY 1969 assume that U.S. material support can be shifted to a sales basis sooner and to a greater extent than we had heretofore planned. Provision has also been made in the FY 1969 program to support relations which ensure our continued access to important military facilities in certain countries, but the aid provided specifically for this purpose is minimal. Small but vital internal security oriented programs and modest training assistance account for virtually all of the remainder.

Thus, for FY 1969, our grant aid request totals only \$420 million (compared with the \$380 million appropriated by the Congress last year for the same purpose) plus \$120 million to help finance military export sales. Of the \$420 million requested for grant aid, \$387 million would be for the forward defense countries of Korea, the Republic of China, the Philippines, Iran, Greece and Turkey. . . .

With respect to military export sales for FY 1969, we expect orders to total about \$1.5 billion, about \$0.3 billion less than the level currently expected for FY 1968. Of this total, we estimate government-to-government cash orders will amount to about \$520 million, and that orders placed directly with U.S. industry will be about \$480 million. The balance of \$550 million will be government-to-government orders against credit arranged for or provided by the Defense Department.

Military export sales, I would like to remind you, are not an end in themselves. They are an integral and essential part of our collective defense and overall foreign policies. We are not in the business of selling arms, per se. In fact, during the period 1952-61, we furnished as grant aid several times more arms than we sold. We provided this military grant aid in the interest of the

collective defense of the Free World. Now the relative proportion of grant aid and military sales has been reversed. But we continue to sell arms, today, both on a cash and credit basis, for the very same reason. Every arms transaction—whether it be grant aid, or a cash sale, or a credit sale—must meet the same fundamental test: Is it in the interest of collective defense and our overall foreign policy? Only then do we consider how it should be financed.

If a friendly nation requiring the arms is in a position to pay cash, certainly there would be no reason why we should not make the sale for cash. Where a nation has the economic capacity to pay for the arms over a longer period of time but cannot pay cash on delivery, it is only common sense to sell on credit. In those few cases where credit cannot be arranged through private banks without a government guaranty, it seems to me that it makes eminently good sense to facilitate the transaction by providing that guaranty. Finally, where a Free World nation needs military equipment or services but has no prospects of repaying the cost, or could do so only at unacceptable cost to its developmental programs, we should furnish the arms on a grant aid basis. But in every case the transaction must contribute to the collective defense of the Free World, or otherwise support our overall foreign policy.

Of course, the military export sales program helps our balance of payments position, but our difficulties in this area, in the first place, are attributable in very large measure to our efforts in behalf of collective defense. (I will discuss the balance of payments problem a little later.) However, this program helps to reduce the costs, both to our allies and ourselves, of equipping our forces, by minimizing costly duplicative development programs and by realizing the economies of larger scale production. And, it also helps to further cooperative logistics arrangements with our allies and standardization of our respective supply systems. Thus, there is a net gain for all.

As I pointed out last year, we have carefully circumscribed this program:

- We will not sell military equip-

ment to a foreign country which we believe it cannot afford.

- We will never recommend that a potential foreign customer buy anything not truly needed by its own forces.

- We will not seek to sell a foreign country anything it can buy cheaper or better elsewhere in the Free World.

Every proposed sale of U.S. military equipment, whether it originates in commercial or government-to-government channels, is carefully viewed within the Executive Branch. Any significant proposal receives Cabinet level, and frequently Presidential, scrutiny before approval. Moreover, such approval is never forthcoming until a positive decision has been made that, all things considered, the sale is in the overall best interests of the United States and the purchaser. We have, in fact, turned down, cut back, or discouraged scores of prospective sales. The value of those turned down from the less developed countries by far exceeds the value of those approved. . . .

As indicated earlier in this statement, the tribulations suffered by both the grant and sales programs in the Congress last year should be of great concern to anyone who believes in the principle of collective defense. I hope that all members of this Committee will join in obtaining the public and Congressional understanding and support necessary for these vital adjuncts to our own direct military efforts.

Impact of the Defense Program on the Balance of Payments

. . . For the past several years, the Defense Department has conducted a comprehensive program to limit the impact of its activities on our balance of payments. The result of this effort through the last completed fiscal year is reflected in Figure 1 (page 6).

As you can see, excluding the impact of the conflict in Southeast Asia, we have been able to hold defense expenditures abroad to the 1961 level, notwithstanding substantial increases in wages and prices. (For example, between 1961 and 1966 wages in Germany rose 52 per-

cent and in Japan by 61 percent; during the same period the cost of living in Germany rose 16 percent and in Japan by 34 percent.) After the net adverse balance on the "Defense" account (shown on the last line) had been reduced from \$2.8 billion in FY 1961 to \$1.5 billion in FY 1965, it rose again to \$2.3 billion in FY 1967. This rise is almost completely attributable to the extraordinary foreign exchange costs of the Vietnam conflict, which amounted to \$1.5 billion in FY 1967. Indeed, if not for the Vietnam conflict our net adverse balance in FY 1967 would have been only \$0.8 billion, compared with \$2.3 billion in FY 1961, due in large measure to the increase in receipts from foreign military sales.

In this connection, I should caution that the high level of receipts in FY 1967 was unusual and will almost certainly not be repeated this year or next. The amount realized last year benefited from a bunching of receipts from our recent offset arrangement with the Federal Republic of Germany. That arrangement, under which Germany offset the bulk of foreign exchange costs of our deployments in that country by making equivalent purchases of U.S. military goods and services, has now run its course. To provide a partial offset during the current fiscal year, Germany has agreed to purchase a half billion dollars of U.S. Government medium-term securities. We are now working with the Treasury and other government agencies to develop similar arrangements for the future, not only with Germany, but with other countries as well.

In past years I have described in some detail the many specific actions we have taken to curtail overseas military spending. Every measure which offered some prospect of help in this regard has been thoroughly investigated. Wherever we found that they could be implemented without impairing required combat capabilities or imposing undue hardship on the individual serviceman or his dependents, this has been done.

However, in view of the continued deterioration in our payments position, which has resulted in the decision to impose strong controls on private investment abroad and to seek a major reduction in overseas tourist spending, we are again re-

viewing our current efforts to see where they may be intensified. In this regard, we have long since exhausted the "easy" opportunities for savings and any new savings will be most difficult. Clearly, the best hope of reducing our foreign exchange spending would be a substantial reduction in U.S. overseas deployments. For the immediate future, this does not appear to be a likely prospect. Southeast Asia deployments in FY 1968 and FY 1969 are scheduled to rise above the average for FY 1967. This fact, coupled with the likelihood of higher prices, civilian wages and military compensation, and the lower military sales receipts now projected means that we must expect a further rise in the net adverse balance on the "Defense" account for this year and next. Nevertheless, considering the "belt tightening" now being undertaken by other elements of our economy, we must seek new ways to reduce the foreign exchange impact of spending by U.S. forces abroad. We also intend, consistent with the overall arms sale policies which I have just discussed, to urge our allies to procure U.S. weapons and other military equipment wherever feasible.

Concluding Remarks on the International Situation

In presenting to this Committee the Defense Department's Budget request for the last fiscal year of the 1960s, I believe it is not inappropriate to reflect for a moment on the very great changes which have occurred in the world during the past decade. These years have seen the acceleration of a number of trends which will make the international environment of the 1970s markedly different from that of the 1950s and early 1960s.

In the 1960s the simple bi-polar configuration which we knew in the earlier post-World War II period began to disintegrate. Solid friends and implacable foes are no longer so easy to label, and labels which did useful service in the past, such as "Free World" and "Iron Curtain," seem increasingly inadequate as descriptions of contending interests within and between blocs, and of the new bonds of common interest being slowly built across what were thought to be impenetrable lines of

demarcation. Yet this tendency toward a more pluralistic world, which is in our interest and consistent with our national philosophy, is still only a tendency. Within many nations the factions who see advantage in constructively exploiting this tendency are weak. Part of our job is to make it evident to potential adversaries that this more pluralistic world would have rewards for them also. But to make our case we must still face them with the prospect of encountering a well coordinated alliance of nations willing to do battle to preserve their rights to independence and self-determination. Despite the emerging multipolarity of power and the decline of simplistic Cold War ideologies, collective security arrangements are still a necessity. The strong must still make commitments to defend the weak from those who would force a political and economic order upon them.

Thus collective security remains the foundation of our defense policy. Ultimately, however, true international security will be found only in proper relations among states, not in hardware. This was my theme at Montreal two years ago, and I would emphasize it again now. If we look ahead toward the last quarter of the 20th Century, the world's overwhelming security problem will be

the establishment of a proper relationship between the developed and well fed societies and those which are hungry and neglected. This relationship will have to include a collective effort by the modern, technologically efficient, developed world to help the underdeveloped world to a decent existence. That task will require the devotion of political and economic efforts far surpassing any in which we now engage.

To provide the needed effort, the developed world will have to compose its internal differences by agreement, not by coercion, and to organize itself for the common job to be done. It seems the lesson of human history that nations will join together effectively for such great efforts only when a common danger to their security is perceived. We must do our best to prepare ourselves and our friends, and even those who think of themselves as our adversaries, for the day when they perceive the common potential danger to our security of a hungry, angry, dissatisfied, and impatient majority of mankind. We in the United States must stand ready to cooperate in all those areas in which progress toward a safe, more human global order can be made. Our security, and the quality of life within the United States, demand it.

U.S. Military Balance of Payments

	(\$ Billions)						
EXPENDITURES (on Def. Acct.)	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965	FY 1966	FY 1967
U.S. Fcs. and their Spt. (Excl. Incr. in SEA Exp. over FY 61)	2.5	2.4	2.4	2.5	2.3	2.4	2.5
Military Assistance	.3	.2	.3	.2	.2	.2	.1
Other (AEC, etc.)	.3	.3	.3	.1	.1	.1	*
TOTAL	3.1	3.0	3.0	2.8	2.6	2.7	2.6
RECEIPTS (on Def. Acct.)	— .3	— .9	— 1.4	— 1.2	— 1.3	— 1.2	— 1.8
NET ADVERSE BALANCE (Excl. Incr. in SEA Exp. over FY 61)	2.8	2.1	1.6	1.6	1.3	1.5	.8
Increase in SEA Exp. over FY 61	—	*	.1	.1	.2	.7	1.5
NET ADVERSE BALANCE	2.8	2.1	1.7	1.7	1.5	2.2	2.3

* Less than \$50 million.

Figure 1.

Strategic Forces

The forces and programs included under this heading, i.e., the strategic offensive forces, the strategic defensive forces, and the civil defense program, constitute the foundation of our general nuclear war capabilities and are accordingly treated in this section of the statement as an integrated whole.

The General Nuclear War Problem

Over the past seven years, in my annual appearances before this Committee, I have attempted to explore with you in a systematic way all of the major elements of the general nuclear war problem—the nature of strategic nuclear war; the size and character of the forces likely to be involved; the technical feasibility, cost and probable outcomes of alternative strategies; and the principal policy and program choices opened to us and our allies. I have done so because I believe a common understanding of all of these factors is essential to an informed and reasoned discussion of the crucial decisions which we in the Executive Branch and you in the Congress must make each year in this most vital area of our defense program.

This is not to say that the need for consideration of the general nuclear war problem had been overlooked prior to 1961, or that I and my associates clearly understood, or even perceived, all of the multi-faceted aspects of this vastly complex problem from the very outset. Quite the contrary, many of the fundamental concepts and insights which underlie our nuclear policies and programs today were developed prior to 1961, and my own views have matured and become more precise since that time. Indeed, many of the issues which came to a head in 1961 had been debated for years. All needed to be resolved so that we could get on with the job of

reshaping our strategy and our forces for the decade of the 1960s.

It seemed to us in 1961 that one of the first things we had to do was to separate the problem of strategic nuclear war from that of all other kinds of war. Although the matter had long been debated, the fact that strategic nuclear forces, no matter how versatile and powerful they may be, do not by themselves constitute a credible deterrent to all kinds of aggression had still to be squarely faced. . . .

Many of the tasks we set out for ourselves seven years ago have been successfully accomplished. But, the situation which we foresaw then is now well upon us. The Soviets have, in fact, acquired a large force of ICBMs installed in hardened underground silos. To put it bluntly, neither the Soviet Union nor the United States can now attack the other, even by complete surprise, without suffering massive damage in retaliation. This is so because each side has achieved and will most likely maintain over the foreseeable future, an actual and credible second strike capability against the other. It is precisely this mutual capability to destroy one another, and, conversely, our respective inability to prevent such destruction, that provides us both with the strongest possible motive to avoid a strategic nuclear war.

That we would eventually reach such a stage had been clearly foreseen for many years. Five years ago I pointed out to this Committee that: "We are approaching an era when it will become increasingly improbable that either side could destroy a sufficiently large portion of the other's strategic nuclear force, either by surprise or otherwise, to preclude a devastating retaliatory blow."

In January 1956, Secretary of Defense Wilson noted that, "... independent of what year it might happen, within a reasonable number of

years we are almost bound to get into a condition sometimes described as 'atomic plenty' or a condition where the two parties could, as a practical matter, destroy each other." In the following month, Secretary of the Air Force Quarles was even more explicit. He said, "I believe it will mean that each side will possess an offensive capability that is so great and so devastating that neither side will have a knockout capability, and, therefore, a situation in which neither side could profitably initiate a war of this kind. . . . This has been frequently referred to as a position of mutual deterrence, and I believe we are moving into that kind of a situation."

Indeed, as far back as February 1955, a distinguished group of scientists and engineers, frequently referred to as the Killian Committee, had concluded on the basis of a comprehensive study of our continental air defense that within probably less than a decade a nuclear attack by either the United States or the Soviet Union would result in mutual destruction. "This is the period," the Committee's report stated, "when both the U.S. and Russia will be in a position from which neither country can derive a winning advantage, because each country will possess enough multimegaton weapons and adequate means of delivering them, either by conventional or more sophisticated methods, through the defenses then existing. The ability to achieve surprise will not affect the outcome because each country will have the residual offensive power to break through the defenses of the other country and destroy it regardless of whether the other country strikes first."

Clearly, nothing short of a massive pre-emptive first strike on the Soviet Union in the 1960s could have precluded the development of the situation in which we now find ourselves. This point, too, was noted by Secretary McElroy in 1958. Indeed, the hearings of the Congressional Committee concerned with national defense during that period are replete with references to this crucial issue.

Be that as it may, the problem now confronting the nation is how best to ensure our safety and survival in the years ahead, in an era when both we and the Soviet Union will continue to

have large and effective second strike strategic offensive forces, and when the Red Chinese may also acquire a strategic nuclear capability.

I believe we can all agree that the cornerstone of our strategic policy must continue to be the deterrence of a deliberate nuclear attack against either the United States or its allies. But this immediately raises the question, what kind and level of forces do we need to ensure that we have such a deterrent, now and in the foreseeable future?

Having wrestled with this problem for the last seven years, I am convinced that our forces must be sufficiently large to possess an "Assured Destruction" capability. By this I mean an ability to inflict at all times and under all foreseeable conditions an unacceptable degree of damage upon any single aggressor, or combination of aggressors—even after absorbing a surprise attack. One can add many refinements to this basic concept, but the fundamental principle involved is simply this: it is the clear and present ability to destroy the attacker as a viable 20th Century nation and an unwavering will to use these forces in retaliation to a nuclear attack upon ourselves or our allies that provides the deterrent, and not the ability partially to limit damage to ourselves.

This is not to say that defense measures designed to significantly limit damage to ourselves (which is the other major objective of our strategic forces) might not also contribute to the deterrent. Obviously, they might—if an increase in our "Damage Limiting" capability could actually undermine our opponents confidence in his offensive capability. But for a Damage Limiting posture to contribute significantly to the deterrent in this way, it would have to be extremely effective, i.e., capable of reducing damage to truly nominal levels—and as I will explain later, we now have no way of accomplishing this.

As long as deterrence of a deliberate Soviet (or Red Chinese) nuclear attack upon the United States or its allies is the vital first objective of our strategic forces, the capability for Assured Destruction must receive the first call on all of our resources and must be provided regardless of the costs and the difficulties involved. That imperative, it seems to me, is well understood and ac-

cepted by all informed Americans. What is not so well understood, apparently, is the basis upon which our force requirements must logically be determined—in other words, how much Assured Destruction capability do we need and what is the proper way to measure that need?

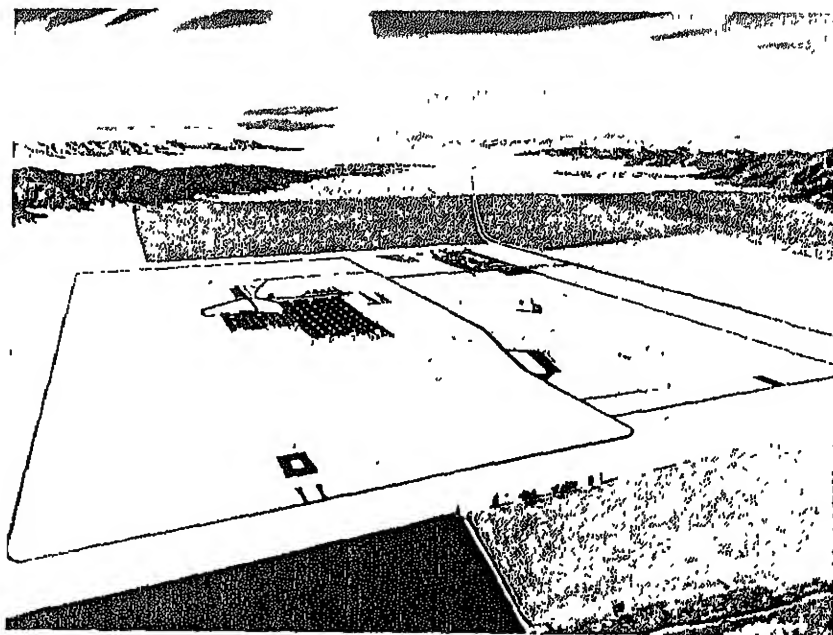
The debate on how much is enough, I suspect, is as old as war itself, but it acquired a new and very special significance with the advent of the atomic bomb. . . .

As I have explained to the Committee in previous years, this question cannot be answered precisely. Some people have argued that the Soviet or Red Chinese tolerance of damage would be much higher than our own. Even if this were true (which is debatable), it would simply mean that we must maintain a greater Assured Destruction capability. For example, if we believe that a 10 percent fatality level would not deter them, then we must maintain a capability to inflict 20 or 30 percent, or whatever level is deemed necessary. In the case of the Soviet Union, I would judge that a capability on our part to destroy, say, one-fifth to one-fourth of her population and one-half of her industrial capacity would serve as an effective deterrent. Such a level of destruction would certainly represent

intolerable punishment to any 20th Century industrial nation.^a

The next question which has to be answered is: What kind and how large a force do we need to ensure at all times and under all foreseeable conditions that we can inflict the desired level of damage on the attacker? Obviously, the number of strategic missiles and aircraft we need cannot be determined solely on the basis of some fixed ratio to the number our opponents might have or, for that matter, to the number of nuclear war-

^a Red China represents a somewhat different problem. Today Red China is still far from being an industrial nation. What industry it has is heavily concentrated in a comparatively few cities. We estimate, for example, that a relatively small number of warheads detonated over 50 Chinese cities would destroy half of the urban population (more than 50 million people) and more than one-half of the industrial capacity. And, as I noted last year, such an attack would destroy most of the key governmental, technical, and managerial personnel, as well as a large proportion of the skilled workers. Since Red China's capacity to attack the United States with nuclear weapons will be very limited at least through the 1970s, the ability of even so small a portion of our strategic forces to inflict such heavy damage upon them should serve as a major deterrent to a deliberate attack on us by that country.



Sketch of one possible tactical site of anti-ballistic missile system.

heads or the gross megatonnage those weapons could carry. Certainly, these are very important factors, each in its own right, and they must be and are taken into account in our calculations. But these are not the only or even most important factors. The requirement for Assured Destruction forces can be determined logically only on the basis of the size and character of the target system they may be called upon to destroy, taking account of all of our weapons which at any given time are ready to be launched toward their targets; the number of these which could be expected to survive a Soviet surprise first attack; and the number of the "ready," "surviving" weapons which can reasonably be expected to reach the objective area, survive the enemy defenses, and detonate over or on their intended targets.

Thus, a logical determination of strategic force requirements involves a rather complex set of calculations. You may recall that when I appeared here six years ago in support of our first Five Year Defense Program, I described the steps of this process in some detail.

In view of the misunderstandings which have arisen over the issue, I believe it might be useful to restate them here.

The first step is to determine the number, types and locations of the aiming points in the target system.

The second step is to determine the numbers and explosive yields of weapons which must be delivered on the aiming points to ensure the destruction or substantial destruction of the target system.

The third step involves a determination of the size and character of the forces best suited to deliver these weapons, taking into account such factors as size of warhead, system reliability, delivery accuracy, ability to penetrate enemy defenses, and cost.

Since we must be prepared for a first strike by the enemy, allowances must also be made in our calculations for the losses which our own forces would suffer from the initial enemy attack. This, in turn, introduces additional factors:

- The size, weight, and effectiveness of a possible enemy attack.
- The degree of vulnerability of our own strategic weapon systems to such an attack.

Clearly, each of these factors involves various degrees of uncertainty. But these uncertainties are not unmanageable. By postulating various sets of assumptions, ranging from optimistic to pessimistic, it is possible to introduce into our calculations

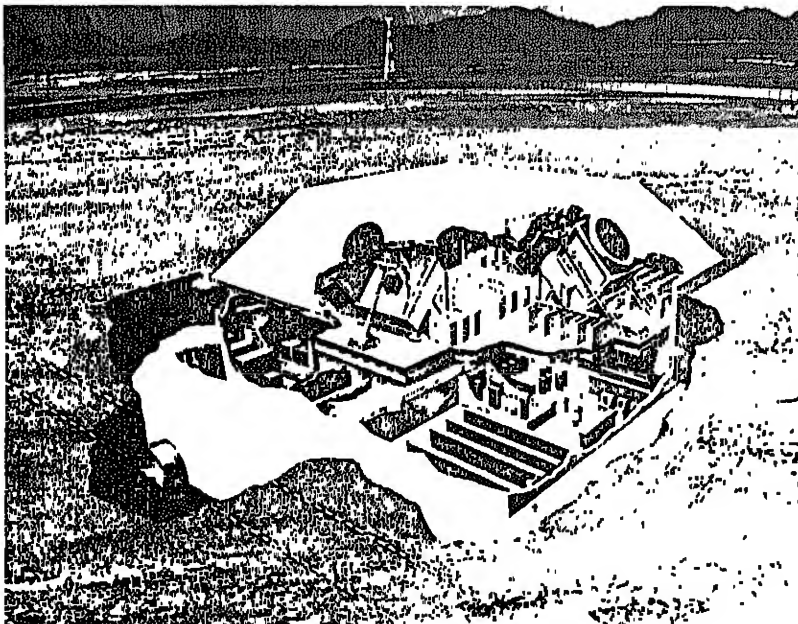
reasonable allowances for these uncertainties. For example, we can use in our analysis both the higher and lower limits of the range of estimates of the number of enemy ICBMs and long-range bombers. We can assign to these forces a range of capabilities as to warhead yield, accuracy, reliability, etc.

With respect to our own forces, we can establish, within reasonable limits, the degree of reliability, accuracy and vulnerability of each type of offensive weapon system and its ability to penetrate the enemy defenses under various modes of operation. The last factor also involves an estimate of the size and character of the enemy's defenses.

Obviously, a change in any major element of the problem necessitates changes in many other elements. For example, the Soviet's deployment of a very extensive air defense system during the 1950s forced us to make some very important changes in our strategic bomber forces. The B-52s had to be provided with penetration aids—i.e., standoff missiles, decoys, electronic countermeasure equipment, etc. In addition, the B-52's airframe had to be substantially strengthened to permit sustained low-altitude operations.

Now, in the late 1960s, because the Soviet Union might deploy extensive anti-ballistic missile (ABM) defenses, we are making some very important changes in our strategic missile force. Instead of a single large warhead, our missiles are now being designed to carry several small warheads and penetration aids, because it is the number of warheads, or objects which appear to be warheads to the defender's radars, that will determine the outcome in a contest with an ABM defense.

Gross megatonnage is not a reliable indicator of the destructive power of an offensive force. For example, one missile carrying 10 50-kiloton warheads (a total yield of $\frac{1}{2}$ -megaton) would be just as effective against a large city (2,000,000 people) as a single 10-megaton warhead with 20 times the total yield. Against smaller cities (100,000 people) 10 50-kiloton warheads would be three and one-half times as effective as the single 10-megaton warhead, and against airfields 10 times as effective. Even against hard ICBM sites, the 10 50-kiloton warheads would (given the accuracy we anticipate) be more



Artist's concept of missile site radar (MSR) shown in cutaway.

effective than a single 10-megaton warhead. And, of course, it would take 10 times as many ABM interceptors to defend a city against 10 50-kiloton warheads as it would against a single 10-megaton warhead.

It is clear, therefore, that gross megatonnage is an erroneous basis on which to compare the destruction capability of two forces. And as I pointed out to the Committee last year, the number of missiles on launchers alone is not a much better measure. Far more important is the surviving number of separately targetable, serviceable, accurate, reliable warheads. But the only true measure of relative effectiveness of two Assured Destruction forces is their ability to survive and to destroy the target systems they are designed to take under attack.

In terms of numbers of separately targetable, survivable, accurate, reliable warheads, our strategic forces are superior to those of the Soviet Union. But I must caution that in terms of national security, such "superiority" is of little significance. For even with that "superiority," or indeed with any "superiority" realistically attainable, the blunt, inescapable fact remains that the Soviet Union could still effectively destroy the United States, even after absorbing the full weight of an American first strike.

We should be under no illusion that Damage Limiting measures, regardless of how extensive they might be, could, by themselves, change that situation. This is so for the same reason that the deployment by the Soviets of a ballistic missile defense of their cities will not improve their situation. We have already taken the necessary steps to guarantee that our strategic offensive forces will be able to overcome such a defense. Should the Soviets persist in expanding what now appears to be a light and modest ABM deployment into a massive one, we will be forced to take additional steps. We have available the lead time and the technology to so increase both the quality and the quantity of our strategic offensive forces—with particular attention to more sophisticated penetration aids—so that this expensive Damage Limiting effort would give them no edge in the nuclear balance whatsoever. By the same token, however, we must realistically assume that the Soviet Union

would take similar steps to offset any threat to their deterrent that might result from our deploying an ABM defense of our own cities.

Under these circumstances, surely it makes sense for us both to try to halt the momentum of the arms race which is causing vast expenditures on both sides and promises no increase in security. The logic of discussions to limit offensive and defensive strategic weapons is even more compelling than it was a year ago when the President proposed such discussions to the Soviet Union. We are continuing our attempt to persuade the Soviets to agree to our proposal for discussions.

It is important to distinguish between an ABM system designed to protect against a Soviet attack on our cities and an ABM system designed for other purposes. One such purpose would be to provide greater protection for our strategic offensive forces; another would be to protect our cities against an attack by Red China. The first is not a Damage Limiting measure, but rather an action designed to strengthen our Assured Destruction capability by ensuring the survival of a larger proportion of our retaliatory forces. The second is a Damage Limiting measure, but one against a small force—because of the size and character of the attacks involved, a good defense becomes feasible.

As I noted last year, Red China may achieve an initial ICBM operational capability in the early 1970s and a modest force in the mid-1970s. Depending upon the rate of growth

thereafter, a thin ABM deployment, with some additions and improvements, could be highly effective through the mid-1980s. The ability of the thin ABM to limit damage to our nation in the event our offensive force failed to deter an "irrational" aggressor was the basis for our decision to deploy such a force.

Before I discuss the analytical basis for these conclusions and our specific program proposals, I would first like to present the latest estimates of the strategic threat.

The Size and Character of the Threat

Each year in presenting our projections of the strategic nuclear threat to the United States, I have cautioned that, while we have reasonably high confidence in our estimates for the closer-in period, our estimates for the more distant years are subject to considerable uncertainty. This is still the case with regard to our current projections. The estimates through 1969 are reasonably firm. Beyond that point they become progressively less firm, especially where they deal with the period beyond the production and deployment lead times of the weapon systems involved.

The Soviet Strategic Offensive-Defensive Forces

Summarized in Figure 1 are the Soviet strategic offensive forces estimated for Oct. 1, 1967. The programmed U.S. forces for those same dates are shown for comparison.

U.S. vs Soviet Intercontinental Strategic Nuclear Forces

	1 Oct 1967	
	U.S. ^a	USSR
ICBM LAUNCHERS ^b	1054	720
SLBM LAUNCHERS ^c	656	30
Total Intercont'l Msl. Launchers	1710	750
INTERCONTINENTAL BOMBERS ^d	697	155
Total Force Loadings—Approx. No. of Warheads	4500	1000

^a These are mid-1967 figures.

^b Excludes ICBM test range launchers which could have some operational capability against the U.S. Soviets also have MR/IRBMs capable of striking Eurasian targets.

^c In addition to the SLBMs on nuclear-powered submarines the Soviets also have SLBMs on diesel-powered submarines whose primary targets are believed to be strategic land targets in Eurasia. The Soviets also have submarine-launched cruise missiles whose primary targets we believe to be naval and merchant vessels.

^d In addition to the intercontinental bombers, the Soviets have a force of medium bombers/tankers capable of striking Eurasian targets.

Figure 1.

Intercontinental Ballistic Missiles. Over the past year, the Soviets have continued their buildup of hardened and dispersed land-based missiles. We estimate that, as of Oct. 1, 1967, they had a total of 720 ICBM launchers operational compared to 340 a year earlier. We believe the Soviet ICBM force will continue to grow over the next few years, but at a considerably slower rate than in the recent past.

As you may recall, I announced last November that the Soviets were intensively testing what we believe to be a Fractional Orbit Bombardment System (FOBS). Such a system, which is really an ICBM of different trajectory, could be launched on a very low trajectory across the northern approaches of the United States, thus reducing the possibility of timely detection by the Ballistic Missile Early Warning System (BMEWS); or, alternatively, around the southern approaches which are not covered by BMEWS. In either event, the weapon would not have a very high order of accuracy and would have to pay a heavy penalty in payload. It would, therefore, be useful primarily against soft targets. Although years ago we considered and rejected such a system for our own use, the Soviets may believe it to be useful in a surprise nuclear strike against our bomber bases or as a penetration tactic against ABM systems. Later, in my discussion of the defensive programs, I will touch on some of the measures we have taken in anticipation of that type of threat.

Anti-Ballistic Missile Defense. Last year I noted that in addition to the Galosh system around Moscow, the Soviets were deploying another type of defensive system elsewhere in the Soviet Union. I cautioned, however, that the weight of the evidence at the time suggested that this system was not intended primarily for ABM defense. Now, I can tell you that the majority of our intelligence community no longer believes that this so-called "Tallinn" system (which is being deployed across the northwestern approaches to the Soviet Union and in several other places) has any significant ABM capability. This system is apparently designed for use within the atmosphere, most likely against an aerodynamic rather than a ballistic missile threat.

Although construction of the Galosh ABM system around Moscow

is proceeding at a moderate pace, no effort has been made during the last year to expand that system or extend it to other cities. It is the consensus of the intelligence community that this system could provide a limited defense of the Moscow area but that it could be seriously degraded by sophisticated penetration aids. Nevertheless, knowing what we do about past Soviet predilections for defensive systems, we must, for the time being, plan our forces on the assumption that they will have deployed some sort of an ABM system around their major cities by the early 1970s.

Red Chinese Nuclear Threat

Our current estimates of the Red Chinese nuclear threat are essentially the same as those I presented here last year. The Chinese have the manpower and industrial capabilities required for the deployment of ballistic missiles, and we believe that they are making an intensive effort to develop a medium range missile. We estimate that the first of these missiles could be deployed as early as 1967-68 and that by the mid-1970s, they could have a modest force operational.

With regard to ICBMs, we continue to believe that the Chinese nuclear weapons and ballistic missile development programs are being pursued with a high priority. However, it is now clear that they failed to conduct either a space or a long-range ballistic missile launching before the end of 1967, as we thought possible last year. We still believe such a launching could be made on relatively short notice. In any event, our estimate last year that it appeared unlikely the Chinese could achieve an initial operational capability with an ICBM before the early 1970s, or deploy a significant number of operational ICBMs before the mid-1970s, still holds. And, of course, those ICBMs would not have a very high degree of reliability, speed of response, or protection against attack.

The Red Chinese also have several types of aircraft which could carry nuclear weapons, but most of them have a limited operational radius and none have an intercontinental radius. It is highly unlikely on the basis of cost alone that they would undertake the development, production and deployment of an intercontinental

bomber force. If they chose to do so, it would take them a decade or more before they could deploy such a force.

Capabilities of the Proposed U.S. Forces for Assured Destruction

As I noted earlier, the only true measure of the effectiveness of our Assured Destruction forces is their ability, even after absorbing a well coordinated surprise first strike, to inflict unacceptable damage on the attacker. In this next portion of my statement, I would like to examine with you our latest analyses of how well our strategic forces can be expected to accomplish that mission: first, against the "highest expected threat" projected in the latest National Intelligence Estimates (NIE) and, second, against a Greater-Than-Expected Threat.^b

Capability Against the "Highest Expected Threat" in the NIE

Even if the Soviet strategic forces by 1972 reach the higher end of the range of estimates projected in the latest NIEs, and even if they were to assign their entire available missile force to attacks on our strategic forces (reserving only reserve missiles and bomber-delivered weapons for urban targets), about one-half of our forces programmed for 1972 would survive and remain effective. If the Soviets expand the Moscow ABM defense and deploy the same or a similar system around other cities at the highest rate projected in the latest NIEs, about three-quarters of our surviving weapons would detonate over their targets. The destructive potential of such a U.S. retaliatory attack is illustrated by Figure 2 (page 12).

Even if the Soviets deploy a substantial number of ABM interceptors by 1972, our strategic missile forces alone could still destroy more than two-fifths of their total population

^b The "highest expected threat" in actually composed of the upper range of NIE projections for each element of the Soviets' strategic forces. In many cases, these represent alternatives and it is highly unlikely that all elements would ever reach the top end of the quantitative range simultaneously. Therefore, the "highest expected threat" is really greater than that projected in the NIE.

(more than 100 million people), and over three-quarters of their industrial capacity. As Figure 3 demonstrates, beyond 400 one-megaton equivalents optimally delivered, further increments would not meaningfully change the amount of damage inflicted because we would be bringing smaller and smaller cities under attack.

These results, of course, reflect the decisions we have taken in recent years to enhance the future capabilities of our Assured Destruction forces, including:

- The production and deployment of the Poseidon missile with Multiple Independent Reentry Vehicles (MIRV).
- The production and deployment of improved missile penetration aids.
- The increase in the proportion of Minuteman IIIs (with MIRVs and a new improved third stage) in the planned force.
- The initiation of development of new small reentry vehicles in order to increase substantially the number of warheads (or penetration aids) which can be carried by a single missile.
- The development and production of Short Range Attack Missiles (SRAM) for our strategic bombers.

These and other measures will not only enhance the survivability of our strategic missile forces but will also greatly increase the number of weapons which we could place over the Soviet Union in 1972. As I stated earlier, numbers of weapons will be much more important in the future than gross megatonnage. Our calculations show that, even if the Soviets deploy a substantial number of ABMs by 1972, our offensive forces (after absorbing a surprise attack) would still be able to inflict about the same percent fatalities on the Soviet population in a second strike in 1972 as they could have in 1966.

Indeed, if the Soviet offensive-defensive threat does not increase beyond the highest level now projected through 1972 in the latest National Intelligence Estimates, we will have more Assured Destruction capability than we will probably need. However, I have repeatedly cautioned that our Assured Destruction capability is of such crucial importance to our security that we must be prepared to cope with Soviet strategic threats which are greater than those projected in the latest intelligence

estimates. Accordingly, we must continually reexamine the various actions, beyond those which now seem probable, by which the Soviets might seek to strengthen their strategic forces and take appropriate steps in a timely manner to hedge against them.

Capability Against Greater-Than-Expected Threats

As was the case last year, the most severe threat we must consider in planning our Assured Destruction forces is a Soviet deployment of a substantial hard target kill capability in the form of highly accurate small ICBMs or MIRVed large ICBMs, together with an extensive, effective ABM defense. A large Soviet ICBM force with a substantial hard target kill capability might be able to destroy a large number of our Minuteman missiles in their silos. An extensive, effective Soviet ABM defense might then be able to intercept and destroy a large part of our residual missile warheads, including those carried by submarine-launched missiles. In combination, therefore, these

two actions could conceivably seriously degrade our Assured Destruction capability.

Again, I want to remind you that both of these threats are quantitatively far greater than those projected in the latest intelligence estimates. Moreover, we believe that the accuracy of Soviet ICBMs is still substantially inferior to that of our own missiles. Nevertheless, even though such a threat is extremely unlikely, we have taken account of the possibility in our longer range force planning.

Our calculations show that against either one of the Soviet Greater-Than-Expected Threats, the offensive or the defensive threat, the presently programmed forces could still perform their mission through the mid-1970s.

Against the massive and highly unlikely combined Greater-Than-Expected Offensive and Defensive Threats, these same forces with Poseidon missiles carrying a full load of warheads and with bomber penetration aids (options which we could exercise in FY 1970) could still destroy in a second strike (depending

Soviet Population and Industry Destroyed			
(Assumed 1972 Total Population of 247 Million; Urban Population of 116 Million)			
1 MT Equiv Delivered Warheads	Total Population Fatalities		Industrial Capacity Destroyed (Percent)
	Millions	Percent	
100	37	15	59
200	52	21	72
400	74	30	76
800	96	39	77
1200	109	44	77
1600	116	47	77

Figure 2.

U.S. Fatalities from a Chinese First Strike, 1970s			
(Number of Chinese ICBMs)			
U.S. Fatalities (in millions)	X	2.5X	7.5X
Without Sentinel	7	11	15
With Sentinel	"	"	1

* Fewer than one million U.S. dead with some probability of no deaths.

Figure 3.

upon how we target our forces) about 18 to 25 percent of the population and two-thirds to three-quarters of the industrial capacity of the Soviet Union, even after absorbing a surprise attack. The prospect of having to absorb losses of this magnitude from a U.S. retaliatory strike should, in itself, poses a very substantial deterrent to the Soviet Union. Nevertheless, for the purpose of planning our forces so far ahead, this level of damage may become too low for complete confidence in our deterrent. Accordingly, prudence dictates that we act now to place ourselves in a position to strengthen our Assured Destruction capabilities in the unlikely event that both of the Greater-Than-Expected Threats actually begin to emerge.

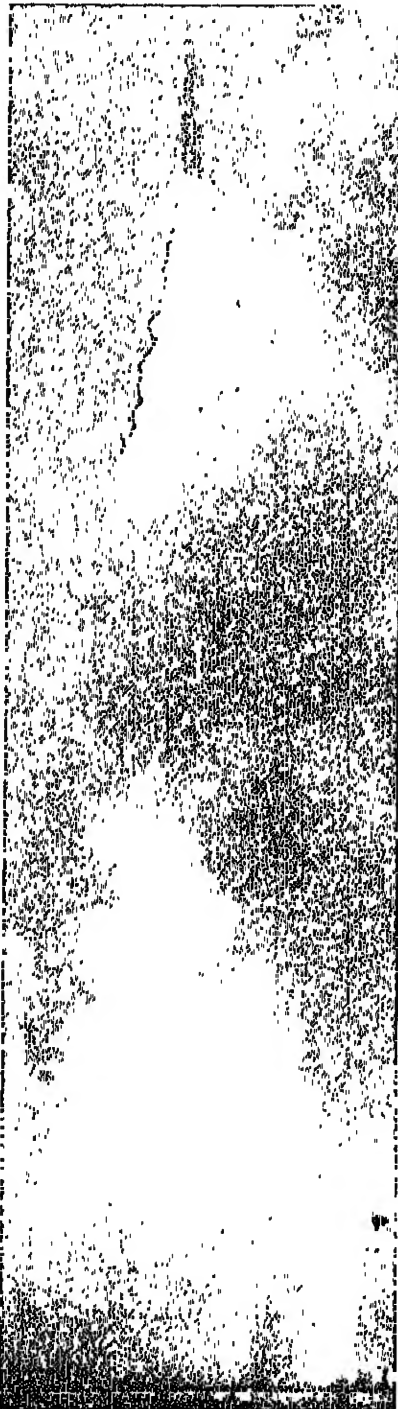
Fortunately, we have a large number of additional options from which we can draw to strengthen those capabilities by the mid-1970s. We can convert the entire force to Minuteman III, increase the number of warheads each Minuteman missile could carry, emplace the entire Minuteman III force in superhard silos, and/or protect the Minuteman force with an ABM defense.

There are, of course, still other options available, such as the construction and deployment of more Poseidon submarines, and the development and production of a new land-based missile. Although a new land-based ICBM does not appear to offer any particular advantage over the Minuteman III in superhard silos, I believe we should keep that option open by starting development now of a silo which could be used for either the Minuteman III or a new ICBM. The options of defending Minuteman with the ABM and of constructing more Poseidon submarines will continue to be available for some time into the future and neither requires a commitment at this time.

As I noted in previous years, under certain circumstances there may be some advantage in maintaining a mixed offensive force of missiles and a limited number of bombers. By having a capability to attack some cities with missiles only, and others with bombers only, we can force the Soviet Union to maintain defenses against both. But to do this, we do not need either a very large bomber force or a new bomber. The present program provides for a mixed force of missiles and bombers into the

later part of the 1970s, and the options open to us will permit extending the life of the bomber force and increasing its capability, and/or the addition of a new bomber, should threats greater than that projected by the NIE develop.

Against the Greater-Than-Expected Threat, any bomber force ought to be equipped with improved



Minuteman missile.

penetration aids to cope with the kind of anti-bomber defense systems postulated in this threat. We have no evidence the Soviets are actually deploying such systems, although they are developing new, high performance fighter aircraft. Nevertheless, we should keep the options open to upgrade our presently programmed bomber force and to deploy a new bomber if one should eventually be required. But the pacing items at the present time are the penetration aids, particularly those needed to counter the improved interceptors the Soviets may deploy in the future, and these are the programs which should receive our first attention regardless of which option we may ultimately choose to exercise.

Again, may I remind you that all of these missile and bomber options are directly related to the combined Greater-Than-Expected Threat and, until we have some evidence that this threat is actually beginning to emerge, we need not and should not decide to deploy any of these systems. Instead, we should carefully time our actions on all of them in step with the development of the threat, keeping in mind the various development, production and deployment leadtimes involved.

Capabilities of the Proposed Forces for Damage Limitation

There are two major issues this year in the Damage Limitation portion of the Strategic Forces Program. The first concerns the deployment of an anti-ballistic missile defense and, the second, the future size and composition of the anti-bomber defense forces.

Anti-Ballistic Missile Defense

Last year I presented to you in considerable detail our analysis of the anti-ballistic missile defense issue. I described the three major purposes for which we might want to deploy an ABM system, the kinds of radars and missiles which would be involved, the technical uncertainties which still remained to be resolved, and the costs and benefits of some of the alternative deployments. With regard to the three purposes, I concluded that:

- The deployment of an ABM defense for Minuteman might offer a

partial substitute for the further expansion of our offensive forces in the event the Greater-Than-Expected Soviet threat began to emerge.

- The deployment of an austere ABM defense against a Red Chinese ICBM threat might offer a high degree of protection to the entire nation, at least through the 1970s.

- The deployment of an ABM defense for the protection of our cities against the kind of heavy, sophisticated missile attack the Soviets could launch in the 1970s would almost surely cause them to react by increasing the capabilities of their offensive forces, thus leaving us in essentially the same position we were before.

Further study of this issue during the last year has served to confirm these conclusions. Since I have already touched on the first purpose in connection with the analysis of our Assured Destruction capabilities against the Greater-Than-Expected Soviet threat, I will limit my discussion at this point to the other two purposes.

Defense Against the Red Chinese Nuclear Threat. As I noted earlier, there is mounting evidence that the Red Chinese are devoting very substantial resources to the development of both nuclear warheads and missile delivery systems. Within a period of 39 months, they detonated seven nuclear devices. . . .

These seven nuclear tests, taken together with their continuing work on surface-to-surface missiles, lead us to believe that they are moving ahead with the development of an ICBM. Indeed, if their programs proceed at the present pace, they could have a modest force of ICBMs by the mid-1970s.

In the light of this progress in nuclear weapons and missile delivery systems, it seemed both prudent and feasible to us last September to initiate the deployment of an austere Chinese-oriented ABM defense. We knew from our continuing study of this system that it could be deployed at an investment cost of about \$5 billion, and could be highly effective against the kind of threat a Chinese force might pose in the 1970s.

As presently defined, the Sentinel ABM system (i.e., the system specifically designed against the Chinese threat) would consist of Perimeter Acquisition Radars (PARs), Missile Site Radars (MSRs), long range

Spartan area defense missiles and, later, some Sprint local defense missiles for certain special purposes. The effectiveness of this deployment in reducing U.S. fatalities from a Red Chinese attack in the 1970s is shown in Figure 3.

It is apparent from this table that the Sentinel system, facing a relatively "primitive" attack, could probably hold U.S. fatalities below one million. Obviously, if and when the Chinese ICBM force grows quantitatively and qualitatively beyond the levels shown in Figure 3, additions and improvements would probably have to be made in the Sentinel system. We believe, however, that for relatively modest additional outlays the system could be improved so as to limit the Chinese damage potential to low levels into the mid-1980s. The Sentinel system would also have a number of other advantages. It would provide an additional indication to the people of Asia that we intend to support them against nuclear blackmail from China, and thus help to convince the non-nuclear countries that acquisition of their own nuclear weapons is not required for their security. Furthermore, this initial deployment would serve as a foundation to which we could add a defense for our Minuteman force if that later becomes desirable. Finally, it could protect our population against the improbable, but possible accidental launch of a few ICBMs by any one of the nuclear powers.

Deployment of Nike-X for Defense of Our Cities Against Soviet Attack. Nothing has occurred during the last year to change my conviction that the deployment of the Nike-X system for the defense of our cities against a Soviet attack would, under present circumstances, be a futile waste of our resources. I believe it is clear from my earlier discussion of the trends in the nature of the threat, as evaluated by our intelligence community, that the Soviets are determined to maintain a nuclear deterrent against the United States. If this is true, as I believe it is, any attempt on our part to reduce their Assured Destruction capability below what they might consider necessary to deter us would simply cause them to respond with an offsetting increase in their offensive forces. It is precisely this process of action and reaction upon which the arms race feeds, at great cost to both sides and

benefit to neither. This point is illustrated in Figure 4 which is based on nuclear strike capabilities as they might be viewed by the potential adversaries.

Posture A is a light defense against a Soviet missile attack on our cities. It consists of an area defense of the entire continental United States, providing redundant (overlapping) coverage of key target cities to provide some protection against these warheads which get through the area defense. Posture B is a heavier defense with the same area coverage, but with much greater sophistication in its electronics and a higher-density Sprint defense for 52 cities.

Postures A and B would also require some improvement in our defense against manned bomber attack in order to preclude the Soviets from undercutting the ABM defense; we would also want to expand and improve our antisubmarine warfare forces to help defend against Soviet missile-launching submarines. The "current" estimates of the investment cost of the total Damage Limiting package are at least \$13 billion for Posture A and at least \$22 billion for Posture B. On the basis of past experience, however, actual costs would more likely be \$40 billion by the time the system had been completed.

Cost, however, is not the problem. If we could actually build and deploy a genuinely impenetrable shield over the United States, we would be willing to spend \$40 billion. But, if after spending these tens of billions of dollars, we could still expect to find ourselves in a position where a Soviet attack could inflict unacceptable damage on our population because of their response to our defensive efforts, I do not see how we would have really improved our security or freedom of action. And neither can I see how the Soviets will have improved their security and freedom of action, if, after all their additional expenditures for offensive and defensive systems, we can still inflict unacceptable damage on them, even after absorbing their first strike. For this reason we have come to the conclusion that both sides would be far better off if we can reach an agreement on the limitation of all strategic nuclear forces, including ABMs.

In any event, there is no point whatever in our responding to a massive ABM deployment on their part with a massive ABM deployment of

our own. Instead, we should act realistically and further strengthen our offensive forces, if and when necessary, to preserve our assured destruction capability.

Anti-Bomber Defense

Three years ago, when I appeared before this committee in support of the FY 1966 Defense Budget, I said: "One of the major issues we face in the Strategic Defensive Forces is to determine the proper overall level of the anti-bomber defense program. Our present system for defense against manned bomber attack was designed a decade ago when it was estimated that the Soviets would build a force capable of attacking the United States with many hundreds of long-range aircraft. This threat did not develop as estimated. Instead, the major threat confronting the United States consists of the Soviet ICBM and submarine launched ballistic missile forces. With no defense against the ICBM and only very limited defenses against the submarine launched ballistic missiles, our anti-bomber defenses could operate on only a small fraction of

the Soviet offensive forces in a determined attack. Moreover, the anti-bomber defense system itself is vulnerable to missile attack. It is clear, therefore, as it has been for some years, that a balanced strategic defense posture requires a major reorientation of our efforts—both within anti-bomber defense and between anti-bomber and anti-missile defenses."

Now that the anti-ballistic missile defense issue has been resolved, we are in a position to move forward intelligently on the solution of the anti-bomber defense problem. As you know, we have had this matter under study for quite some time, and in all of the various alternative force structures examined we have found that the indispensable element is a new Airborne Warning and Control System (AWACS). The reasons AWACS is so important are: its ability to track aircraft at low altitudes; its ability to provide detection at great distances from the United States; and its low vulnerability to missile attack compared with the existing ground-based surveillance, warning and control network.

The feasibility of AWACS, however, depends upon the successful development of a "downward-looking"

airborne radar which can provide detection coverage of aircraft over land at any altitude. Last year I told you that we had a test program under way to examine three proposed solutions to the problem of developing such a radar which would be able to overcome the problem of ground clutter, and that we hoped to have sufficient data available by the end of the year to demonstrate the feasibility of the concept. Only then, I pointed out, would we be in a position to decide on the future composition of the anti-bomber defense forces. This work has, in fact, been progressing very well, and we now believe the required technology is within our reach. In fact, at least two of the possible solutions I mentioned last year look extremely promising, and we will eventually have to choose between them. Accordingly, the time is ripe for a comprehensive examination of the entire air defense problem.

There are six possible purposes that our air defense system might serve in the 1970s:

- Peacetime identification to prohibit free access over North America from the air. This purpose requires only a thin area-type defense plus a high quality surveillance capability.

- Nth country defense to prevent damage from an attack by such countries as Cuba, Red China, etc. This purpose would require a relatively thin but leak-proof, area-type defense and a good surveillance capability.

- Discouraging the Soviet Union from developing and introducing new bomber threats which would be costly to neutralize. This purpose would require that we have the capability to deploy within a reasonable period of time an upgraded air defense capable of countering both quantitative and qualitative improvements in the Soviet strategic bomber force, and that the Soviets be aware of our capability. Thus, this purpose places requirements on our research and development program but does not, in itself, demand the actual deployment of

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NUMBERS OF FATALITIES IN AN ALL-OUT STRATEGIC EXCHANGE, MID-1970s ^a					
(In Millions)					
U.S. Program	Soviet Response	Soviets Strike First Against Military and City Targets, U.S. Retaliates Against Cities		U.S. Strikes First at Military Targets, Soviets Retaliate Against U.S. Cities, U.S. Retaliates Against Soviet Cities	
		U.S. Fat.	Sov. Fat.	U.S. Fat.	Sov. Fat.
No ABM	None	120	120	120	80
SENTINEL	None	100	120	90	80
	Pen-Aids	120	120	110	80
Posture A	None	40	120	10	80
	MIRV, Pen-Aids	110	120	60	80
Posture B	+100 Mobile ICBMs	110	120	90	80
	None	20	120	10	80
	MIRV, Pen-Aides	70	120	40	80
	+550 Mobile ICBMs	100	120	90	80

^a At fatality levels approximating 100 million or more, differences of 10 to 20 million in the calculated results are less than the margin of error in the estimates.

Figure 4.

achieving this objective is highly dependent on the overall effectiveness of our ABM capability. Air defense can make a major contribution in saving lives only if the United States deploys a strong missile defense and the Soviets do not respond effectively.

- Precluding an attack on our withheld strategic missile forces. This purpose requires a capability to prevent bombers from making serial attacks on a large number of missile targets with multiple gravity bombs. The current air defense system has already forced the Soviets to change their aircraft payloads to the extent that their bomber threat to our Minuteman force has been reduced to minor proportions.

- Providing a complete mobile "air defense package" which would include a transportable control system and a refuelable or long-range interceptor, preferably one which is capable of close combat under visual identification rules.

The Soviet heavy bomber force is expected to decrease gradually as their ICBM force continues to grow. (Medium bombers are not expected to play an important part in any attack on the continental United States.) Moreover, as previously noted, we have no evidence that the Soviets are developing a new advanced intercontinental bomber. Nevertheless, as in the case of the missiles, we cannot preclude the possibility of greater Soviet manned bomber threats by the mid-1970s. And, no matter how unlikely, we must also guard against a fighter/bomber attack from Cuba and possibly other nations.

For purposes of analysis, we examined a number of alternative forces, three of which I would like to discuss with you now. These three pretty well cover the range of choices available to us. The first alternative would be to continue the current air defense forces at least through the mid-1970s. The second would be to modernize the forces with AWACS for warning and control and the F-12 for interception. The third alternative lies midway between the other two, and would provide for AWACS and the upgrading of the F-106 with an enhanced fire control system (including a "look-down" capability to engage low-altitude targets) and a new

air-to-air missile. These forces and their costs are summarized in Figure 5.

Under Alternative 2 and 3 the entire SAGE/BUIC ground environment would be phased out, leaving only the radars operated by the Federal Aviation Agency for peacetime air surveillance. However, some Over the Horizon (OTH) "backscatter" radars would be added to provide an aircraft early warning capability.

We have tested the three alternative forces against both the expected Soviet bomber threat and a number of different Greater-Than-Expected-Threats which the Soviets could mount in the 1976 time period. The results fully corroborated the basic conclusion we have drawn from all our air defense studies conducted to date, namely, that AWACS is of the first order of importance, the fire control/missile system is second, and the interceptor aircraft's performance is third.

The F-12 would be superior in discouraging such future threats as very long range ASMs and supersonic bombers, whereas the F-106X would be superior in discouraging SRAMs, decoys and self-defense missiles. The F-106X would be best in the mobile air defense role. No air defense system can provide significant Damage Limiting capabilities against the U.S. S.R. unless accompanied by a strong, effective ABM, a capability which is presently unattainable. Our analysis also showed that Alternatives 2 and 3 provide a good capability against Nth countries. On balance, the AWACS/F-106X force seems to be the proper choice at this time.

I would now like to turn to our specific proposals for the Strategic Forces in the FY 1969-73 period.

Strategic Offensive Forces

The force structure proposed for the FY 1969-73 period is shown on a classified table provided to the Committee.

Missile Forces

In overall terms the missile forces we are proposing for the FY 1969-73 period are essentially the same as those I discussed last year—1,000 Minuteman, 496 Poseidon and 160 Polaris, plus 54 Titan II. Within these overall numbers, however, we are proposing some changes in mix and payload.

Minuteman. Last year I told you that in order to increase the capability of our offensive forces against a possible strong Soviet ABM defense, we proposed to increase the number of Minuteman IIIs in the force. I also pointed out that by FY 1973-74 it would probably become necessary to replace the earliest Minuteman II missiles, and that we could then add more Minuteman IIIs if that should appear desirable.

Although the Soviet ABM deployment is not moving forward as fast as anticipated last year, we now believe it would be desirable to increase the number of Minuteman IIIs. And, as I indicated earlier, we have included funds in the FY 1969 Budget for the development of dual-purpose super-hard silos for the Minuteman or a new land-based ICBM. . . .

Titan II. Although the Titan II will decline in importance as the Minuteman III and the Poseidon are deployed, it may be advisable to retain the present force of 54 missiles on launchers. . . . With the procurement of a small number of missiles in FY 1969-70, we can maintain the present

Alternative Area Air Defense Forces, 1976

	Alternative 1	Alternative 2	Alternative 3
Interceptors	F-101,2,4,6	F-12 ^a	F-106X
Airborne Cmd & Cntrl	EC-121	AWACS	AWACS
Ground-based C&C	SAGE/BUIC	FAA Radars	FAA Radars
10 year Prog. Costs ^b	\$11.70 bil.	\$13.70 bil.	\$12.30 bil.
Annual Level-off Cost	\$ 1.12 bil.	\$ 0.75 bil.	\$ 0.69 bil.

^a Plus some F-106s for training and peacetime identification.

^b Total FY 68-77 costs, including elements of the current force until phased out.

Figure 5.

force of 54 Titan missiles on launchers throughout the program period, instead of allowing it to decline after FY 1970 as we planned last year.

Polaris-Poseidon. The Polaris-Poseidon program is essentially the same as the one I presented here last year. . . . The proposed FY 1969 shipbuilding and conversion program includes funds for six Poseidon conversions and advance procurement for nine more.

New Strategic Missile Systems. Last year I told you that we are making a comprehensive study of new strategic missile systems. This study was completed last summer, and on the basis of its findings we have include \$56 million in the FY 1969 Budget for advanced ICBM technology.

Strategic Bomber Forces. The manned bomber forces which we propose to maintain through FY 1973 are the same as those I presented here last year for the FY 1968/72 period.^c The B-52C/Fs and the B-58s will be phased out as planned, leaving an authorized active inventory of 281 B-52G/Hs and 253 FB-111s. (The comparable unit equipment figures are 225 and 210, respectively.) The phase-

^c Aircraft inventory data used in this statement reflect the Authorized Active Inventory (AAI), i.e., unit equipment (UE), pipeline, training and other support aircraft but not advance attrition aircraft.

in of FB-111s will slip slightly, so the phase-down of B-52s will be slowed to keep the same total force as previously planned.

. . . Since the new FB-111s will be entering the bomber force during FY 1969-72, and the B-52G/Hs can be maintained in a suitable operational condition well into the 1970s, there is no urgency for a decision on the production and deployment of a new bomber. Much more important at this time is the development of the new subsystems which old or new aircraft may require to penetrate the Soviet Air defenses in the 1970s, and we have included funds in the FY 1969 Budget for this purpose.

First, we plan to modify a number of B-52s so that they, as well as the FB-111s, can carry the SRAM missile. Second, we will continue work on a wide range of electromagnetic warfare devices, drawing on our most recent experience in Southeast Asia. Third, we will continue advanced development work on the engine and avionics systems integration for possible Advanced Manned Strategic Aircraft (AMSA) application. Last, we will continue studies of more advanced bomber penetration aids.

These subsystems will be designed so that they could be used both on our existing heavy bombers (B-52s) or on a new AMSA-type bomber, as well as on the FB-111 where feasible.

Strategic Defensive Forces

The strategic defensive forces proposed for the FY 1969-73 period are shown in a classified table provided to the Committee. . . .

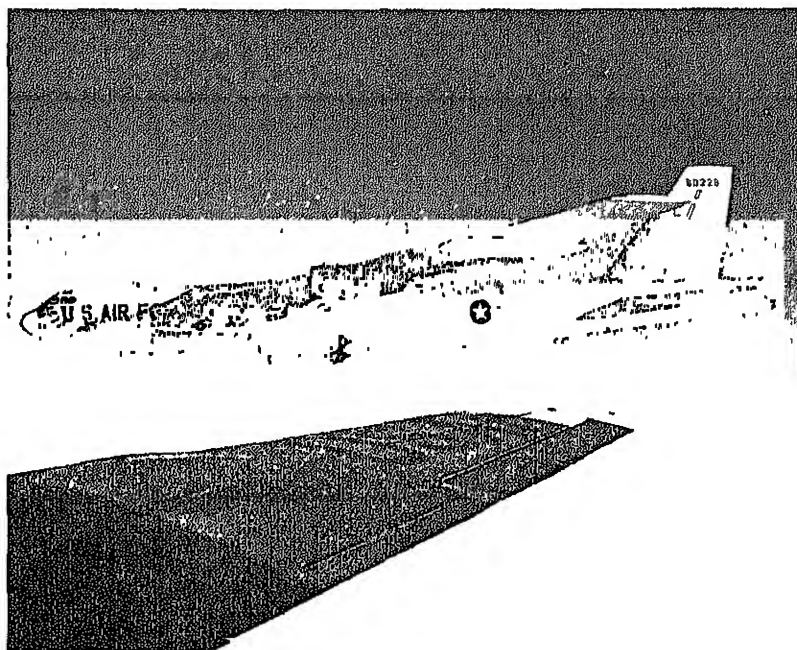
Bomber Defense

The principal elements of the proposed anti-bomber defense program for the 1970s were discussed earlier. The precise phasing and details of the force levels beyond FY 1969 are still subject to change.

Surveillance, Warning and Control. As I noted earlier in my analysis of the anti-bomber defense problem in the 1970s, much of the existing U.S. surveillance, warning and control network can be phased out when the new AWACS and Over-the-Horizon radar become available. At that time, I believe we could phase out all but one of the SAGE Combat Centers, all the SAGE Direction Centers, about half of the search radars, all of the Gap Filler and DEW line radars, and all of the AEW/ALRI aircraft, while retaining the NORAD Combat Operations Center, the manually operated Combat Center in Alaska, 10 BUIC III Control Centers, some of the search radars and the SAM Fire Coordination Centers required for the Nike-Hercules batteries. The elements eliminated from the program would be replaced by AWACS aircraft and new Over-the-Horizon (back-scatter) radars. (We have consulted with the Canadian Government, which has already indicated that it intends to continue its cooperation in the air defense of the continent.)

Manned Interceptors. The ultimate U.S. manned interceptor force will consist of modified F-106X (supported by C-130s which would be used to move ground crews and equipment to the dispersal recycle bases), plus an Air National Guard F-102 squadron in Hawaii. This squadron, together with the search radars, will continue to provide a local air defense capability for that remote state. We plan to start the phase-down of the interceptor forces in FY 1969.

Surface-to-Air Missiles. On the basis of our present plans, all of the Bomarc force would be phased out when the full F-106X force becomes operational. Most of the Hercules and all of the Hawks, however, will be retained.



U. S. Air Force B-52G.

Missile and Space Defense

The decision to deploy a Chinese-oriented ABM defense system will undoubtedly have an important impact on other strategic defense programs. For example, we already know that the Perimeter Acquisition Radar (PAR) planned for the Sentinel system could also be made to handle some of the long-range acquisition and tracking functions presently performed by the three BMEWS sites. Conversely, the Over-the-Horizon (back-scatter) radars planned for the anti-bomber defense could also be used to provide limited detection and tracking of ballistic missiles launched from submarines. Moreover, in order to provide a backup for BMEWS, we have already deployed several Over-the-Horizon (forward-scatter) radar transmitters and receivers, and we have had under active development for a number of years a satellite-borne missile warning system which now appears to be capable of providing earlier warning than BMEWS. (The forward-scatter OTH and the satellite-borne missile warning system are two of the measures I alluded to in my earlier discussion of the Soviet FOBS.) Clearly, the time has come when we must systematically examine all of these warning systems in relation to one another, with a view to eliminating unnecessary redundancy and ensuring that the remaining systems are truly integrated into a workable whole. Accordingly, I have recently asked the Joint Chiefs of Staff to establish a Joint Continental Defense System Integration Planning Staff to study this entire problem in depth, including the functioning of all defensive systems in a wartime environment.

Missile Warning. Pending the completion of the aforementioned study, we are not proposing any changes in the BMEWS program. However, we are making certain changes in the siting of the Over-the-Horizon (forward-scatter) radar program. . . .

As I indicated earlier, we are developing a back-scatter OTH radar for use in the anti-bomber defense. . . . We presently plan to begin installing the first back-scatter OTH radar in the near future. While the chief function of this radar will be research and development, we hope that it will also provide some useful opera-

tional data. It will also give us an opportunity to test the back-scatter system in the ICBM warning role.

Anti-Ballistic Missile Defense (Sentinel). As previously mentioned, the Sentinel system will consist of PAR and MSR radars and Spartan and Sprint missiles.

The PAR is a low frequency phased-array radar used for long-range surveillance, acquisition and tracking. The presently planned characteristics of this radar place its design well within the state of the art, and for this reason the first PAR can be installed directly at its tactical site rather than at a field test site. . . .

The MSR is a phased-array radar used to control the Sprint and Spartan interceptors. It can perform much the same functions as the larger MAR, which is not required in a limited deployment, but on a smaller scale. . . . The MAR, which is the most sophisticated component of the Nike-X system, will remain in a research and development status. A TACMAR (a smaller version of the MAR) will be installed at Kwajalein for final design and testing.

The Spartan missile, as presently designed, will have three stages and utilize an advanced warhead, and should be able to intercept objects at ranges in excess of several hundred miles and at exoatmospheric altitudes. However, we now plan to make some further improvements in the Spartan to enhance its capability against a FOBS. The Spartan will also be included in the full systems tests planned at Kwajalein.

The Sprint missile is designed to attack incoming warheads after the atmosphere has helped to separate out the accompanying decoys, chaff, etc. . . . Initial flight tests are currently being conducted at the White Sands Missile Range, and beginning in early 1969 the missile will be tested at Kwajalein, where the overall systems tests against actual IC BMs fired from Vandenberg Air Force Base will be conducted.

Although, as stated earlier, ABM systems to protect population centers against large sophisticated attacks do not appear practical, we will continue to explore new technical approaches to this objective. The Nike-X development program will be used for this purpose. In addition, we will continue

to support a number of other ABM related programs, particularly AR PA's Project Defender.

In total, the FY 1969 Budget request includes about \$1,232 million for ABM defense: \$651 million for the deployment of Sentinel (in addition to \$229 million in FY 1968); \$313 million for Sentinel development; \$165 million for ABM advanced development (Nike-X); and \$103 million for Defender. In addition, the Atomic Energy Commission's FY 1969 budget includes funds for ABM warhead development and production.

Anti-Satellite Defense. As described in previous years, we have a capability to intercept and destroy hostile satellites within certain ranges. This capability will be maintained throughout the program period.

SPASUR and SPACETRACK are our satellite tracking and identification systems in the NORAD SPA DAT system. . . .

One of the projects that the Joint Continental Defense Systems Integration Planning Staff will undertake is the development of a master plan for the evolution of these two systems. The ever-growing population of space objects and "junk" that must be identified and tracked means that we will have to make major improvements in these systems in the near future. In the case of the Spacetrack system, we have included funds in the FY 1969 Budget for the modification of the data processing and communications equipment at existing sites and for some new construction at these sites. Any further improvements or expansion will be delayed pending a full study of the requirements for electro-optical sites in addition to the camera and radar sites, the links with the Sentinel system, the need for a separate data processing center, etc.

Civil Defense

The Civil Defense program proposed for FY 1969 contemplates no important change in basic objectives from those which I discussed last year. However, we have held the FY 1969 program to the lowest possible sustaining rate, pending the end of the Vietnam conflict. . . . \$77.3 million is request for FY 1969.

General Purpose Forces

The General Purpose Forces include most of the Army's combat and combat support units, virtually all Navy units (except the Ballistic Missile Submarine Force), all Marine Corps units and the tactical units of the Air Force. These are the forces on which we rely for all military actions short of general nuclear war, i.e., limited war and counterinsurgency operations. . . .

Requirements for General Purpose Forces

I need hardly remind you that the overall requirement for General Purpose Forces is related not so much to the defense of our own territory as it is to the support of our commitments to other nations. As I pointed out last year, the fact that each of these commitments gives rise to contingencies for which we must plan does not mean that we will ever be confronted by "40-odd South Vietnams simultaneously." These commitments do not require us to execute automatically any specific contingency plan in response to a given situation, without regard to the circumstances existing at the time. And, while we cannot expect to meet all of the contingencies simultaneously, neither can our opponents.

What we have done over the years is to study a wide variety of possible contingencies involving the potential need for U.S. forces. . . . We have

examined in considerable detail our land and tactical air force requirements for some 16 different contingencies.

. . . We do not plan to meet all the theoretically possible emergencies simultaneously, since the risk of this is very low and the cost very high. Rather, our policy now is to set the size of the General Purpose Forces so that we can simultaneously meet the more probable contingencies.

The largest contingency outside NATO, in terms of potential U.S. force requirements, is a Red Chinese attack on Southeast Asia. Therefore, we must provide, in addition to our NATO requirements, the forces required to meet such an attack in Asia as well as our commitments in the Western Hemisphere. Because of the basic uncertainty inherent in estimates of such requirements, we add to these forces a Strategic Reserve.

I should emphasize that, although we determine the size of our forces in this manner, we have considerable flexibility in meeting other possible contingencies which require smaller forces, or those not requiring as rapid a buildup of forces. For example, in the case of the Vietnam conflict, we used the forces earmarked for a major Asian contingency to meet the immediate needs in the summer of 1965 and then activated temporary forces to meet the longer range needs.

I would now like to review with you each of these major contingencies and the forces required to meet them.

NATO

As I mentioned last year, we have set three major objectives for our NATO non-nuclear forces:

- To deal successfully with a conflict arising through miscalculation.
- To show determination by reinforcing in time of crisis in parallel with a Warsaw Pact mobilization.
- To help deter a deliberate non-nuclear attack by denying the Soviets any confidence of success unless they use a very large force that would clearly threaten NATO's most vital interests, thereby running the attendant risks of rapid escalation to nuclear war.

In all regions except Norway, the NATO-Pact forces are about equal in manpower. NATO has about 900,000 troops deployed in all regions of Continental Europe, compared to 960,000 troops for the Warsaw Pact. While manpower comparisons, alone, are not conclusive measures of military strength, I believe they are reasonable first approximations of relative ground force capabilities.

In the case of air forces, our relative capability is far greater than a simple comparison of numbers would indicate. By almost every measure—range, payload, ordnance effectiveness, loiter time, crew training—NATO (especially U.S.) air forces are better than the Pact's for non-nuclear war, as shown in Figure 1.

As a result of these advantages, which continue to move in our favor every day, we estimate that the NATO M-Day air forces deployed in Central Europe would have significantly more offensive capability than the Pact forces.

If either side chose, the ready land forces could be greatly reinforced before any fighting began (as in the 1961 Berlin Crisis). Assuming a simultaneous mobilization, within 30 days the Pact could probably gain a manpower advantage on the Central Front and a somewhat greater advantage in overall ground combat capability. This gap would then begin to narrow with the arrival of more U.S. forces.

NATO tactical aircraft reinforcements would about equal the Pact's in

Selected Characteristics of Air Forces—All Regions

	NATO (Percent)	Warsaw Pact (Percent)
Primary Mission Capability		
Interceptors (high speed/low payload)	9	34
Multipurpose (high speed/high payload)	31	8
Attack (low speed/high payload)	24	20
Reconnaissance	7	2
Low Performance (low speed/low payload)	29	36
TOTAL	100	100
Payload Index	100	35
Index of Typical Loiter Time	100	20-40
Index of Crew Training	100	55

Figure 1.

the early stages of mobilization, after which we could add considerably more aircraft than the Pact. Our main advantage in this area, however, stems from the great superiority of our aircraft, pilots and weapons just discussed above.

In my judgment, the forces planned are adequate to meet our objectives.

The most likely kind of conflict in NATO Europe is one arising from miscalculation during a period of tension, rather than a deliberately pre-planned Soviet attack. In this kind of crisis, the Soviets would not necessarily have the initiative in mobilizing and deploying troops. Even though the Pact forces could mobilize somewhat faster than NATO, they would not achieve a decisive advantage. Furthermore, NATO has an air advantage. It would thus appear that the balance of forces would, over time, be sufficient to cope with the situation and hopefully lead to a de-escalation of the crisis. Nevertheless, we are urging our allies to improve their reserves and, thus, our confidence of being able to match a Pact buildup.

We cannot entirely discount a deliberate Soviet attack. If the Soviets were to attack following a successful concealed mobilization they could have, temporarily, a substantial advantage in land forces. Our own forces are large enough, however, to require the Soviets to build up and attack with a huge force. Such a buildup would be, at best, difficult to hide. In any event, the Soviet Union, and especially her East European Allies, would have to assume that the West might react against such attack with nuclear weapons. Considering destructive potential of both our theater and strategic nuclear forces and the fact that such a deliberate attack would constitute a clear threat to our vital interests, the Soviets should be strongly deterred from attempting this strategy.

A surprise Soviet attack in the Central Region without a prior buildup might achieve some initial territorial gains, but it would sacrifice the potential advantage of a faster initial mobilization capability and the simultaneous use of East European forces. And, unless reinforced with troops from the Soviet Union or with East European forces, the Soviet forces alone would be inadequate to sustain this kind of attack.

Asia

While China would probably prefer to expand her influence through insurgencies, she might turn to a direct attack on Korea, Taiwan, India, or Southeast Asia if an insurgency were failing and she was willing to risk overt aggression.

At first glance the size of the Asian communist forces—3 million men—suggests that it would be nearly impossible to stop such an invasion (Figure 2).

In fact, however, the Red Chinese have only a limited ability to attack beyond their borders. First, there are great barriers between China and her neighbors: the Himalayas, the jungles of Southeast Asia, and the Formosa Straits. Second, because the Chinese soldier is not nearly as well-equipped and supplied as his American counterpart, he is far less effective in conventional combat. Some indices of the relative firepower and mobility support of Chinese and U.S. soldiers are shown in Figure 3. The average U.S. soldier has three times

the firepower, five times the motor transport, and twenty times the equipment of a Chinese soldier.

Finally, the Asian Communists have limited offensive air ability. The MIG-15s, 17s and 19s, comprising 85 percent of the Chinese Air Force, cannot attack targets much beyond the borders of China because of their limited range and the location of Chinese airfields.

When one examines the invasion threat on a theater-by-theater basis, it is clear that, despite the huge Chinese Army, existing U.S. and local forces provide both a strong deterrent and the ability to defend important areas.

India. Indian forces of 1.1 million men should be able to defend their country against Chinese aggression. The Indian forces have more firepower per man than the Chinese and, with vastly improved communications and transportation, can move quickly to reinforce critical areas. The Indian forces deployed forward are now much larger than they were in 1962 when the Chinese attacked.

Asian Communist Forces				
	China	North Vietnam	North Korea	Total
Active Land Forces	2,851,000	442,000	345,000	3,138,000

Figure 2.

Indices of Relative U.S./Chinese Firepower and Mobility Support Per Man			
(U.S. = 100)			
	Chinese		
	U.S.	Southeast Asia Task Force	Korean Task Force
Major Direct Fire Weapons	100	28	40
Area Fire Weapons	100	36	43
Motor Vehicles	100	19	26
Helicopters	100	0	0
(Quantities of Major Equipment Per Man in Theater Measured in U.S. Dollars)			
	100	5	10

Figure 3.

Taiwan. Nationalist Chinese land forces (372,000) are fully adequate to defeat a Chinese amphibious assault, even if the Red Chinese used their entire amphibious assault force and a sizable portion of their air and naval forces.

Korea. Republic of Korea (ROK) land forces provide a strong deterrent against even a maximum Chinese/North Korean attack.

The Chinese/North Koreans would have a manpower advantage during the early stages of a mobilization. This advantage is offset, however, by the ROK's firepower (15 percent more per man), large U.S. air and naval support, the advantages of a prepared defense and large scale fortifications.

Analysis of the Korean War throws light on the defensive forces required. In 1951, the last major Chinese offensive (825,000 men) was stopped by a force of some 535,000. The ROK alone would have more men today than the total UN force in 1951, and the differences in effectiveness that were present then between ROK and U.S./UN troops are now mostly gone.

Southeast Asia. Three main tasks determine the need for U.S. and allied forces to meet the Chinese invasion threat to Southeast Asia. First, we would need defensive forces to stop the attack. Second, we would need forces for rear area security. Third, we would need forces to launch a counterattack if that course is indicated.

The United States and its allies would have an overwhelming tactical air advantage in any Asian war. Although the Asian Communists have a large number of aircraft, 85 percent of them are short range interceptors with limited payload/range capability. The more than 1,000 fighter-attack aircraft now in Southeast Asia are capable of delivering 5-10 times as much payload as the entire Communist force, even with very conservative assumptions regarding the Communist deployment capability.

I will discuss our current Southeast Asia operations and future force requirements for these operations later in this section of the statement.

Control of the Seas

The regional contingencies discussed above require substantial numbers of ships, ranging from attack carriers and amphibious assault ships

to oilers and cargo ships for resupply. All these must be protected against enemy attack by air and submarine.

For this purpose our escort ship requirements total 231 including about a 16 percent overhaul allowance. (I will discuss this program in detail in connection with Navy General Purpose Forces.) Analysis of our escort ship forces shows that anything in excess of some 230 escorts would be over-defending the forces for which they are required. If we needed more overall capability, we would be better off putting our resources into additional carriers, amphibious ships, etc., rather than the escorts.

In addition to providing naval support for the regional contingencies, we also want to have a capability for successfully concluding a war at sea.

Soviet (and to a lesser degree, Red Chinese) attack and cruise missile submarine forces are the main threat to our ability to win a war at sea. As I have stated in past years, our war at sea strategy is based essentially upon the rapid emplacement of ASW forces, comprised of submarines and land- and sea-based ASW aircraft, between the enemy submarines and their potential targets. Recent studies have reaffirmed the potential effectiveness of this concept and the probability that in an all-out war at sea we would be able to destroy a very large proportion of the Soviet submarine force in a matter of a few months, while losing only a relatively small part of the Free World merchant fleet. (We would, of course, lose some of our naval vessels as well during the same period.)

Logistics Requirements

... The General Purpose Forces are now divided into four categories, each with logistics objectives tailored to its particular mission.

The NATO category covers those items which we buy mainly for the defense of NATO

Forces in the Indefinite Combat category are maintained for use where we cannot predict the place of combat.

Forces in combat in Southeast Asia, the third category, are provided with sufficient materiel to replace whatever they consume. This materiel is provided from an active production base.

Forces in the remaining category are those which for various reasons do not fit into any of the above categories for purposes of logistics guidance. These forces provide the training, rotation, attrition reserves, and overhaul base for forces deployed in Southeast Asia or are maintained in anticipation of such a need.

Capabilities of the General Purpose Forces

In the years since 1961, our non-nuclear war capabilities have been greatly increased and made more flexible. Indeed, by the time the decision to come to the assistance of South Vietnam with our own combat units was forced upon us in the summer of 1965, the General Purpose Forces had been brought to an unparalleled level of peacetime readiness. This fact was clearly reflected in the relative speed and effectiveness with which the initial deployment was carried out. Moreover, in most cases we plan further increases in capability by the early 1970s.

In the following pages, I will be discussing at times the capabilities of our forces in terms of quantitative indices of effectiveness. These indices are still quite primitive, and they do not in all cases measure our capabilities in relation to those of possible enemies. The needed improvements in the indices have yet to be made, but even in their present state they provide useful indications of the changes in the combat power of our forces over the years.

Land Forces

In 1961 it was clear that our active and reserve land forces would have to be significantly improved if they were to meet our revised strategic objectives. More specifically, we needed to: add force structure in the form of new divisions and support units; increase the readiness of existing forces through increased manpower and procurement; reorganize and augment the active and reserve divisions to increase their non-nuclear capability for maneuver and firepower; and reorganize the Army and Marine Corps reserve forces to get the right balance between combat and support forces and to ensure that the reserve forces "fit" properly with the active forces.

We increased the number of active

combat assigned Army divisions from 11 to 16, added enough men to man them, and expanded the training base to sustain the force. Total combat assigned divisions (Army and Marine, active and reserve) in the permanent force were increased by 66 percent.

The procurement of conventional weapon and support systems was greatly expanded. For example, during FY 1962-65 direct obligations for Army procurement were about 60 percent greater than during the previous four years. In addition, the Army reorganized its divisions, dropping the nuclear-oriented Pentomic configuration and introducing the ROAD concept. This increased the Army's ability to tailor its forces quickly to meet a variety of combat situations, and also laid the organizational groundwork for the needed increases in firepower and mobility.

The Army's field artillery structure was revised and self-propelled artillery pieces with larger calibers and greater range were introduced. In fact, the total number of artillery pieces authorized in the permanent Army forces increased by 79 percent, and the sustained fire capability by 85 percent. . . .

The number of Army active and reserve mechanized infantry and tank units was increased by 110 percent, and their tanks and tactical vehicles were modernized. . . . By end FY 1968, we will have several thousand M-60s equipped with a 105mm gun, a modern fire-control system, and a diesel engine that gives it greatly increased range over the M-48. In addition, we will have a large number of M-60a and Sheridan light tanks equipped with the new 15mm Shillelagh missile system, which gives us for the first time a long-range fire capability with a high first-shot kill probability. . . .

Much improved mobility, especially for our forces oriented toward underdeveloped areas, was obtained through greater emphasis on helicopters. . . . By the end of FY 1970 (when FY 1968 orders are delivered), we will have about 7,500 modern turbine helicopters with much greater capacity and speed, and higher possible utilization rates than the ones they replaced. . . .

New air mobility concepts were introduced into land force operations. The creation of a provisional air assault division permitted us to test

airmobility concepts in 1964-65, and allowed us to form the first airmobile division in time to deploy it to Southeast Asia in the summer of 1965.

The division force concept was developed to assure that all of the combat and other support units needed to support an engaged division in a distant theater were fully recognized in determining force structure, manpower, and procurement requirements as well as in establishing airlift/sealift requirements. For example, each Army division of about 16,000 men needs twice that number in non-divisional support units in a properly balanced force structure. (This was a principal reason why it was so important to redistribute the reserve force structure, creating the right kind and proper number of support units while reducing the number of divisions.)

We found that support forces had to be increased substantially. By end FY 1968, for example, the Army will have 1.6 times the number of tactical cargo trucks, trailers, and semi-trailers it had in 1961, increasing its capability to carry dry cargo by 82 percent and liquid cargo by 125 percent. . . .

We took a number of actions to improve the readiness of reserve forces and, as previously mentioned, their "fit" with the active forces.

. . . We have now established a bal-

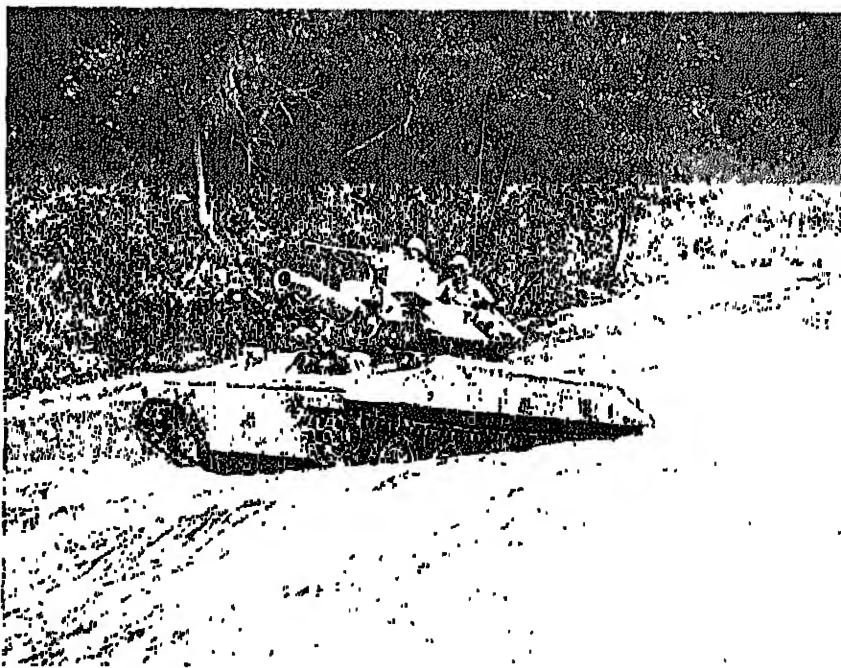
anced reserve force for the Army comprising eight complete division forces plus the division force units needed to round out the Active Army. The new plan calls for 192 hours of training annually for each reservist (plus additional training time for selected personnel) twice that required in 1961. At least half of the 192 hours will be spent in realistic weekend drills and the remainder in drills lasting at least four hours.

We have now formed a complete division force which upon mobilization would have the same capability as an active division force, except for helicopter lift, which would be less than that of an active division force.

Tactical Air Forces

The United States has about 7,000 tactical aircraft and its allies have another 6,000—a total of 13,000. This is . . . about the same as the current world-wide Communist total.

. . . Our tactical air capability has increased dramatically, relative both to 1961 and to the threat. Under our presently planned program this trend will continue through the early 1970s. This increase in overall capability results from the modernization of the forces together with major improvements in conventional ordnance. For instance, we have doubled the payload capability of our tactical aircraft



U. S. Army M551 Sheridan weapon system.

since 1961, and we will double it again by 1972. In 1961, only 15 percent of our fighters had all-weather air-to-air capability, today about 50 percent do, and by 1972 80 percent of them will. With respect to conventional munitions, modern air-delivered, anti-tank weapons reduce substantially the number of sorties required to destroy a given number of enemy tanks compared with the general purpose bombs used in 1961. Similarly, we have developed guided air-to-surface weapons, such as Wall-eye, which reduce the number of sorties required to destroy a target such as a bridge.

In contrast, the present Communist tactical air forces are designed primarily for defense over home territory. Although their aircraft are well suited to the short range interceptor role, they have low payload when used offensively and limited loiter time when used defensively. Today, only about 25 percent of the Communist force, as opposed to 53 percent of the Free World force, are modern aircraft with a significant attack capability. By 1972, more than 75 percent of the Free World inventory will be modern attack aircraft, while the Communists will still have only 25 percent in this category. As a result, the Free World aircraft can carry, on the average, 1.8 times as much payload as the Communist air-

craft today and this will increase to 3.7 times as much by 1972. . . .

Indeed, our relative advantage is substantially greater than the foregoing payload comparison indicates, since we also have better munitions and pilots. The result is that in any major contingency there is little doubt that we and our allies could provide more offensive airpower than the opposing forces. Perhaps the greatest uncertainty in the tactical air force posture is our own vulnerability to attack while our aircraft is on the ground. We need shelters and other defensive measures to protect against such attacks. I shall return to this point later.

Anti-Submarine Warfare Forces

Since 1961, we have substantially increased our ability to detect and destroy enemy submarines and to protect our forces and shipping from them. Under our presently planned program, the increase between now and the early 1970s will be even bigger.

Submarines. Since 1961 we have increased the number of nuclear-powered attack submarines (SSNs) in our fleet from 13 to 33, and the number of "first class" SSNs of Skipjack and later classes from 4 to 24. We expect to increase the force to a total of 60 "first class" SSNs.

Air Anti-Submarine Warfare (ASW) Forces. In 1961 our ASW aircraft were P-5 seaplanes, P-2 land-based patrol aircraft and S-2 carrier-based aircraft. We have been replacing the P-2 and P-5 with the P-3, the last having far greater range and endurance as well as room for our new electronic devices, and more torpedoes, sonobuoys, and crew space. The VSX, whose development was approved this year, will replace the S-2 and improve our sea-based air ASW capability in the same way.

In 1961, we were installing a new system to be used by ASW aircraft, consisting of LOFAR sonobuoys and processors for detecting enemy submarines and CODAR for localizing contacts to permit weapon drop. We have developed a new sonobuoy called DIFAR which promises to improve further our kill capability.

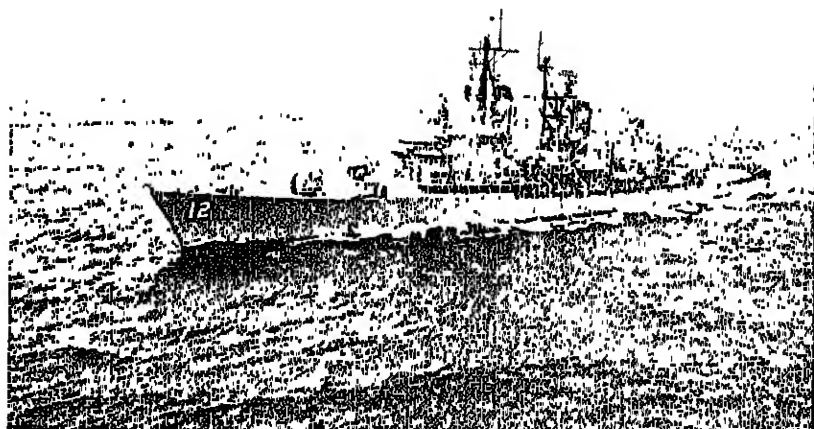
The overall trend in air ASW search capability is shown in the following table:

	End Fiscal Year	
	1961	1968
Airborne ASW (1961 = 100)	100	231

ASW Escort. Since 1961 we have increased the number of our ASW escorts by 14 percent, and their screening capability by 100 percent. The main reason for the larger than proportionate increase in capability is the introduction of the powerful long range SQS-26 sonar, and continuing improvement of present sonars like the medium range SQS-23. The overall increase in escort screening is as follows:

	End Fiscal Year	
	1961	1968
Escort Screens (1961 = 100)	100	163

We have also improved the ability of our escort forces to convert detections to kills. Many of our ASW escort ships now have ASROC (a torpedo delivery rocket). All our escort ships are now equipped with the modern MK-44 torpedo. A still newer weapon, the MK-46 torpedo, is now being introduced and will replace the MK-44.



Guided missile frigate USS Dahlgren (DLG-12).

Fleet Anti-Air Warfare

The air threat to the fleet, in recent years, has come to include anti-ship homing missiles launched from aircraft, submarines, surface ships, and coastal sites. Thus our fleet air defense systems must now be able to handle smaller, faster targets that appear with little warning and may be accompanied by electronic jamming.

To keep pace with the threat, we have considerably improved and expanded our fleet anti-air warfare forces. Twenty of our 30 fighter squadrons have been converted to F-4s since 1961. Similarly, we have been replacing older E-1 warning and control aircraft with more capable E-2s; these latter provide an instantaneous control link with other anti-air warfare forces through the Naval Tactical Data System.

The number of surface-to-air missile ships has increased threefold since 1961 and their overall capability has increased even more, since today's missile systems are many times more effective. Over the next few years we plan to spend about \$700 million to modernize additional missile ships, giving them several times their present capability, and also to build new high performance missile ships (DXGN/DXG).

The following table shows the improvement achieved in our missile ship forces:

	End Fiscal Year	
	1961	1968
Total Missile Ships	23	75
Missile Ships with Naval Tactical Data System	2	15

Amphibious Assault

Another major Navy and Marine Corps mission that has received greatly increased emphasis in recent years is amphibious assault. Our strategic analysis shows:

- That we should have enough assault ships to lift and land the assault echelons of one Marine Expeditionary Force (division/wing team) in the Atlantic and one in the Pacific.

- That the speed of these ships is quite important for Pacific forces and less so for the Atlantic.

The following table shows the past and planned growth in assault lift:

	End Fiscal Year	
	1961	1968
Total, Assault Ships	104	142
Modern, Fast Assault Ships	13	31
Index of Total Lift (1961 = 100)	100	130
Index of Fast Lift (1961 = 100)	100	290

By the mid-1970s the entire Pacific amphibious assault force and one-half the Atlantic force will be made up of modern 20-knot ships. The introduction of the new-design amphibious assault ship, the LHA (now in contract definition), will provide wider assault flexibility—accomplishing in a single ship what it now takes several to do.

Theater Nuclear Forces

In addition to increasing our non-nuclear capabilities since 1961, we have also increased our theater nuclear capability. For example, we have almost doubled the deployment of nuclear weapons in Europe.

Even more important, we have improved the survivability of our tactical nuclear delivery systems by replacing the Mace missile with the mobile Pershing missile, and we are buying an improved Pershing to replace aircraft for nuclear alert, thus freeing more aircraft for the conventional role. Both the Mace missile and tactical aircraft are vulnerable to nuclear attack due to their fixed locations.

NATO's tactical nuclear capability has been substantially enhanced. In FY 1961 we provided virtually no nuclear support to our allies; in FY 1968 we support a wide mix of allied nuclear delivery systems, including: tactical aircraft, Pershing missiles, Sergeant missiles, Honest John missiles, eight-inch howitzers, Nike Hercules missiles.

Southeast Asia Operations

* * * * *

U. S. Forces in Southeast Asia

Last year we budgeted for a total of about 470,000 men in South Vietnam by June 1968, but last summer General Westmoreland requested and

the President agreed to provide additional forces. Thus, by Dec. 31, 1967, we had about 485,000 men there, and this number will grow to a total of 525,000. (Total allied forces in South Vietnam increased from 690,000 in June 1965 to 1,298,000 in December 1967 and are scheduled to grow to about 1,400,000 by June 1968.) The U.S. ground forces in December 1967 included 102 maneuver battalions (79 Army, 23 Marine Corps). The ground forces are now supported by about 3,100 helicopters, and this number will continue to grow.

In June 1965, before the major buildup of U.S. forces in Vietnam began, both the consumption and production of ground ammunition were running at relatively low levels, as is normal in peacetime. Since then, both consumption and production have increased manyfold. During the early months of the force buildup, when consumption outpaced production, ammunition requirements were met by drawing down war reserve stocks which, of course, is just what our planning envisioned. Actually, the amount drawn down was small in relation to our total stocks. (All ground ammunition figures relate to the 40 major items accounting for about 85 percent of the tonnage used in Vietnam.)

During the past year, ammunition production has nearly tripled—from 39,000 tons in December 1966 to 113,000 tons in December 1967—and since June, has equalled or exceeded consumption. Actual consumption of the 40 major items in 1967 was a little over one million tons (compared with last year's estimate of 900,000 tons). Production will continue to increase during the next few months and should level off at about 130,000 tons per month by December 1968, well above the projected consumption rate. The excess of production over consumption will be used to replace the reserve stocks drawn down earlier and will also serve as a safety factor in case consumption exceeds the planned levels. Our reserve production capacity, which will still be large, serves as a second safety factor to meet an even larger consumption requirement. The FY 1969 Budget includes about \$2.8 billion for ground ammunition.

We now have a total of about 1,000 fighter/attack aircraft based in South Vietnam, Thailand and aboard carriers offshore. We are now

flying a total of about 28,000 to 30,000 attack sorties per month. In addition, the B-52 force in 1967 flew a total of more than 800 sorties per month. Total air ordnance consumption was running about 83,000 tons per month in the last few months of 1967. (Air ordnance data refer to the 53 major items which account for about 95 percent of the tonnage used in Southeast Asia.) Production at the close of 1967 was running at about 100,000 tons per month.

As of that date, the world-wide inventory considerably exceeded the June 1965 figure. This is more than we believe is needed with a "hot" production base. Accordingly, we now plan to reduce these inventories somewhat, resuming the buildup to our "cold base" objective after hostilities are terminated. This will allow us to shut down the lines gradually, thereby avoiding unwanted surplus and cushioning the impact on the economy.

Large quantities of air-delivered munitions will continue to be needed, and a total of about \$3.5 billion is included in our FY 1969 request for these items for all the Services.

No major change is planned in the "offshore" naval forces, except for the battleship New Jersey, which will deploy to the South China Sea. The river patrol force will be further increased from about 150 vessels in December 1967 to about 250 by December of this year.

During the past year, we have battle tested the first mobile "Riverine" force in the Mekong Delta. This force of three battalions has been stationed on two naval barracks ships (plus a barracks barge) and at a nearby land base (two battalions afloat and one ashore). We now plan to increase the size of this force.

Other additional deployments to Southeast Asia will require only a very small increase in the number of U.S. military personnel in Thailand, to a total of about 48,000. No significant increase will be needed at our bases in the Western Pacific (Ryukyus, the Philippines, Taiwan, Japan and Guam), where we have about 120,000 military personnel.

Our success in pushing the Communist main force units back into the highlands along the borders of South Vietnam has created new problems. Operating in such close proximity to the borders, our forces do not have much room for maneuver in

attempting to cut off Communist units from their lines of communications. Consequently, we have had to develop new means for interdicting the flow of men and supplies to these units, e.g., the barrier system just south of the DMZ.

Army General Purpose Forces

Last year I described how the "division force" concept had helped us to achieve a better balance among all of the essential elements of our land forces, both active and reserve. Now we have reached the point where we can present these forces on a truly integrated basis.

Division/Brigade Forces

We have found it useful, in developing readiness requirements for specific units and in determining the peacetime distribution of units between the active and the reserve components, to divide the division force into three increments, each with about 16,000 men.

- The Division itself or its approximate equivalent in separate brigades.

- The Initial Support Increment (ISI)—the non-divisional combat and combat support units which are required for the support of the division from the inception of combat operations.

- The Sustaining Support Increment (SSI)—the additional non-divisional combat and combat support and service units required to sustain the division in combat indefinitely.

Generally, the composition of the ISI is comparable to the non-divisional support provided at the corps and field army levels, including such combat units as the armored cavalry regiments. The composition of the SSI is comparable to the theater level line of communication support furnished to field armies, including, for example, separate brigades for rear area security.

Normally, ISI units would deploy with the division itself and, therefore, would have the same readiness requirement. SSI units, however, may be required before, at the same time, or subsequent to the deployment of the division, depending on the particular situation. . . .

In peacetime, most of the SSIs of the STRAF divisions planned for use in areas other than NATO are maintained in the active structure so that the majority of these divisions could be deployed and sustained in combat without a reserve mobilization. The SSIs (and even some of the ISIs) for the STRAF divisions earmarked for NATO, however, can be provided by the reserve components, since we would definitely have to call up the reserves in the event of a war in Europe. Accordingly, these units could be mobilized to coincide with the deployment schedules planned for the divisions they are intended to support.

Shown in Figure 4 are the Army division forces planned for the end of FY 1969 (including the temporary augmentation for Southeast Asia).

We are now planning an Army force structure of 19-2/3 active and 8 reserve division force equivalents for end FY 1969, 1-1/3 more active division forces than planned last year for end FY 1968. One brigade force (i.e., 1/3 division force equivalent) was added to the previously planned structure in FY 1967, and one more infantry division force is being added in FY 1968.

Supporting Forces

The number of separate support brigades in the active force remain unchanged from that presented last year. However, we were planning then to bring the number of reserve brigades up to 16. Under the new reorganization plan, which I will discuss later, the number of separate brigades would be increased to 21, three of which would be in the Army Reserve and 18 in the Army National Guard.

The number of armored cavalry squadrons in the active force will remain at 34 through FY 1969. Five squadrons will be added to the reserve forces in FY 1968 as planned last year. We also have five air cavalry squadrons in the active force.

The number of artillery battalions in the active force in FY 1968-69 has been increased from that planned last year as a result of the recent augmentations of our forces in Southeast Asia.

We have reviewed again the requirement for artillery battalions in the permanent force, especially the

composition and balance between the reserve and active structures. As a result of this review and our experience in Vietnam, we propose to add several heavy battalions to the active structure. With regard to the reserves, we have decided to increase the proportion of heavier artillery and hold the total battalions to a figure slightly below that planned last year.

The engineer construction battalion program is the same as last year, as is the active combat engineer program. The number of reserve combat engineer battalions has been reduced somewhat because an additional company was added to each battalion.

With regard to the surface-to-surface missile forces, we are still studying the requirement for these units and the proper mix of extended range Lance, Honest John, and Sergeant. Technical problems encountered in the development of the Lance propulsion system, however, have not yet been solved, and procurement has thus been limited to test missiles. The additional procurement funds requested for FY 1969 will be used for advanced production engineering, production facilities and test missiles. Moreover, the entire program will be reoriented to the extended range version of the Lance. This version will have an improved engine, which increases the maximum range with a nuclear warhead. Accordingly, we now propose to retain the Honest John battalions in the active force until a new plan for the surface-to-surface missile force is developed and approved.

The SAM-D, a new air defense missile system, has made substantial progress during the past year. . . . We are presently studying the question of replacing Hercules and Hawk with SAM-D.

The shoulder-fired Redeye missile, after much tribulation, has turned out to be an effective weapon against low flying aircraft and is now being procured for combat units.

. . . Between the end of FY 1961 and the end of the current fiscal year, the Army's active aircraft inventory and the pilot inventory will have nearly doubled. The presently planned inventory buildup should be essentially complete with the FY 1969 buy. The chief task for the future is to find some way to improve, signifi-

cantly, the overall utilization of this huge inventory rather than the procurement of more helicopters.

The importance of fixed-wing aircraft in the Army inventory will continue to decline, and by FY 1971 they will constitute less than 20 percent of the authorized inventory. When the conflict in Vietnam ends, we plan to use the assets of the temporary, active Army aviation units to accelerate the buildup and modernization of the reserve component helicopter inventory.

Army Procurement

. . . I will touch on only a few of the highlights at this point. With respect to aircraft, the FY 1969 program is designed to replace attrition and equip the recently authorized temporary units without exceeding, except where absolutely necessary, the quantity required to support the permanent active and reserve units. On this basis, the Army would procure 1,304 aircraft in FY 1969.

Funds are also requested for the procurement of the first operational AH-56A Cheyennes. . . . This option covers the procurement of 375 aircraft over a four-year period.

Difficulties with the Shillelagh missile/gun system have caused us to limit FY 1968 production of the M-60 to those equipped with the 105mm gun and to cut FY 1968 procurement of the Sheridan. For FY 1969, we now propose to procure enough Sheridan and M-60 tanks, all with the Shillelagh missile/gun system, to maintain the minimum sustaining production rate for both

vehicles. An additional quantity of M-60 chassis will be procured in both FY 1968 and FY 1969 for the armored vehicle launched bridge and the combat engineer vehicle.

. . . We still intend to complete the retrofit of a large number of other M-48s programmed in FY 1968 with new diesel engines and fire control equipment. These tanks, plus those already on hand, and those programmed in FY 1967 will meet all presently foreseeable needs for M-48s.

The first three pilot models of the new Main Battle Tank (MBT) have been delivered and are now undergoing testing. . . .

. . . Funds are requested to continue development of the MBT in FY 1969 and for production engineering to support a first procurement of operational tanks in FY 1970, pending an agreement between the U.S. and Federal Republic of Germany governments to go ahead with the program.

With respect to anti-tank missiles, production difficulties with the TOW, a heavy, wire-guided anti-tank weapon, which we planned to procure this year, have caused us to delay procurement until FY 1969. Advance production engineering funds have been included in the FY 1969 Budget for the new medium anti-tank missile, Dragon. . . .

Because of the relatively poor performance of the M-114 reconnaissance vehicle on the kind of terrain found in Vietnam and the limited armored threat to our forces in places other than Europe, we have decided to cancel the final (FY 1968) purchase of the 20mm Hispano-Suiza gun. . . .

Planned Army Division Forces End FY 1969

	End FY 1969		
	Div.	ISI	SSI
Active			
Overseas	14%	14%	10%
U.S.	5	5	1%
Total	19%	19%	12
Res. Components	8	8	15%
Grand Total	27%	27%	27%

Figure 4.

Reorganization of the Army Reserve Components

... We have made considerable progress in realigning the Army's reserve components to prepare them better for that essential role. A priority reserve force has been established with significantly higher levels of manning, equipping, training, and overall combat readiness. The reserve units for which no military requirements exist in contingency war plans have been or are being eliminated, and other units which are needed have been or are being added And, for the first time, the material and personnel requirements of the Army reserve components, which are required to support the contingency war plans, have been fully included in our programs

... The new structure will provide eight full division forces plus 21 separate brigades, together with the units needed to round out the active Army, provide for air defense, etc.—manned at approximately 93 percent or more of tables of organization and equipment.

Associated with the new structure is a total average paid drill strength of 660,000—400,000 in the Army National Guard and 260,000 in the Army Reserve—more than justified

by military requirements but the number prescribed by the Congress in the FY 1968 Defense Appropriation Act No new procurement will be undertaken for these units; instead they will be furnished the necessary material from mobilization reserve stocks.

With the completion of these latest changes, I believe that we will have come close to achieving the basic goal set back in early 1961, i.e., a reserve force tailored to the requirements of our contingency war plans and "so organized, trained and equipped as to permit their rapid integration into the active Army."

Navy General Purpose Forces

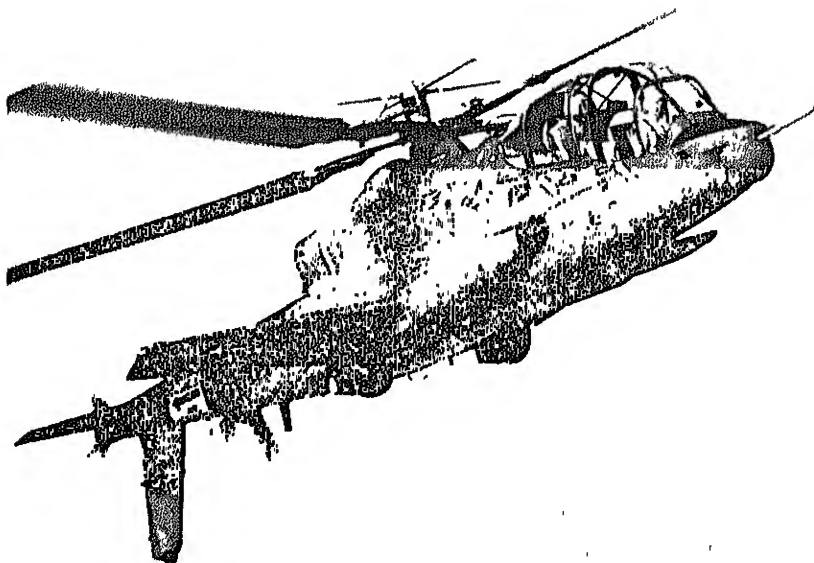
The Navy General Purpose Forces planned for the FY 1969-73 period are shown on the classified tables provided to the Committee. Except for the extension of the Vietnam-related force augmentations for another year and the addition of a battleship for this purpose, the major changes from the program planned last year concern the antisubmarine warfare (ASW) carriers, a new ASW aircraft, the expansion of the ASW detection system, and the escort program.

Before turning to the detailed force proposals, however, I would like to comment on one general problem which permeates the entire shipbuilding and conversion program.

As you will see when we discuss the details of this program, disturbingly large cost increases and delays in commitment of funds have been encountered in recent years. For example, new construction ships in the FY 1969 Budget will cost, in most cases, 25 to 30 percent more than the most recently constructed similar type ship. Major conversion costs have also skyrocketed—in some cases nearly doubling. Apparently, most of the cost increases are related to the current market conditions. All shipyards are now carrying heavy workloads and large backlogs and as a result, private yards are charging higher prices to take on additional work. In part, this is because they, themselves, are paying more for labor and material. Subcontractors, too, are able to charge higher prices since the heavy workload virtually guarantees them a satisfactory level of business. Another factor undoubtedly contributing to the rise in costs is the additional quality assurance controls which we are now insisting upon in order to increase the reliability and maintainability of the equipment we buy.

In view of this situation, although we are planning within the Defense Department essentially the same size General Purpose Force ship construction and conversion program as previously scheduled, we are requesting funds only to the extent that they can be committed in FY 1969—a total of about \$1.1 billion. . . .

As to the future, we are taking several measures to deal with the more fundamental, long term problem of ship construction and conversion. You will recall that I discussed in some detail last year the problem of technological obsolescence in our shipbuilding industry, both public and private, as compared with those of Northern Europe and Japan. With regard to the public sector, the Navy is now developing a plan to modernize its yards during the FY 1969-75 period at an estimated cost of \$600 million Inasmuch as the details of this modernization program have yet to be fully worked out, only \$53.7



U. S. Army AH-56A Cheyenne.

million will be required in the FY 1969 Budget to initiate the effort.

With respect to the private yards, the Defense Department is attempting to offer American shipbuilders greater incentives to modernize their facilities and to increase their overall efficiency. The two most important techniques being used are multi-year contracts and "total package" procurements We now intend to broaden the use of multi-year contract awards to include all new ship construction susceptible to this approach. We also plan to use this technique in the modernization and conversion programs wherever feasible.

Of perhaps even greater significance over the long run is the "total package" procurement approach, under which the contractor is asked to bid on the whole "package", i.e., the design, development, and construction of an entire group of ships for delivery over a period of years. Our experience in the recent competition for the Fast Deployment Logistic (FDL) ship indicated that a multi-year "package" procurement can make a major yard modernization or the construction of an entirely new facility financially attractive to prospective bidders. Two of the three competing bidders included the construction of a new shipyard in their bid proposals, while the third would have undertaken major improvements to an existing yard. Estimates of total cost and delivery time for the 30-ship FDL program also show that one-year "package" procurement would be about 15-20 percent cheaper and up to 10-15 percent faster than a multi-year buy divided among two or three shipyards (i.e., 10-15 ships each).

We presently have two other "total package" multi-year procurements planned for major ship types, i.e., the amphibious assault ship (LHA) and new escort (DX/DXG) programs described last year

I also wish to reaffirm my view, expressed here last year, that there is no reason why the American shipbuilding industry should not be, in a technological sense, as good as the best any other country has to offer. We have the necessary technology and management knowhow—indeed, the series production and assembly line techniques being applied today in

foreign yards were borrowed from us in the first place. While we may never overcome the foreign wage rate differential, intensive application of labor saving techniques and automation could reduce considerably the importance of this factor. I am convinced that a considerable improvement in efficiency and a reduction in shipbuilding costs are possible, if our disgracefully wasteful subsidy program is reorganized to reward efficiency and penalize inefficiency in ship construction and ship operation as well.

I urge the Congress to support the multi-year contract and total package procurement policies which are designed to reduce costs to the Government and to stimulate the modernization of a technologically obsolete industry.

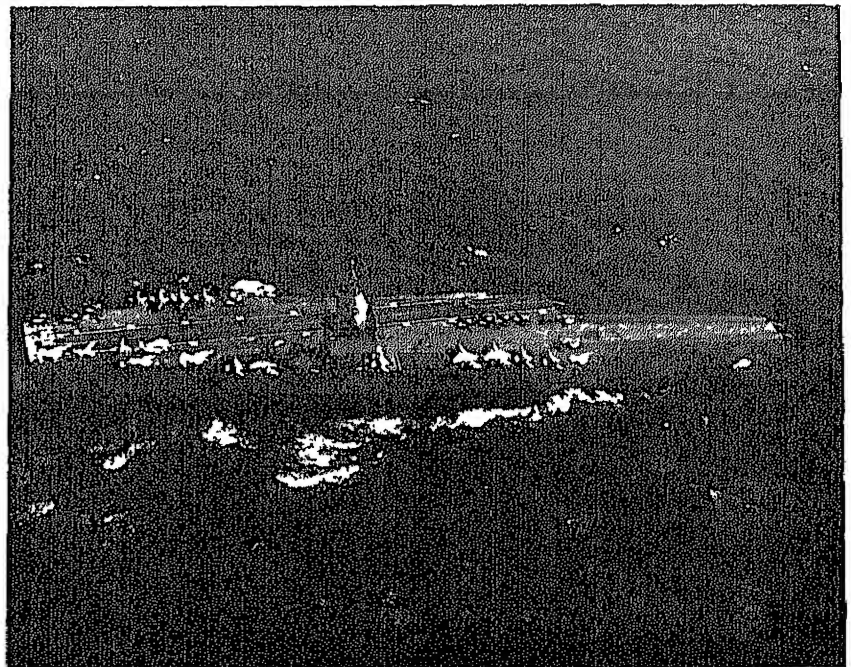
Attack Carrier Forces

Our concept of the optimum size and configuration of the attack carrier forces has continued to evolve over the years in the light of new analyses and additional experience. . . .

Ships. As shown in the classified table provided the Committee, the attack carrier force at the end of the current fiscal year will comprise the nuclear-powered Enterprise, seven

Forrestal, two Midway, and five Hancock/Essex-class carriers plus one carrier (Midway) in conversion. The newest of the conventionally powered CVAs, the John F. Kennedy, was launched this past year and is scheduled to enter the fleet in early FY 1969. A second nuclear-powered carrier, the Chester W. Nimitz, is currently under construction and scheduled to join the fleet in FY 1972

As I have stated in past years, we plan to replace all the old Essex-class CVAs, building to a force of four nuclear-powered ships, eight Forrestal and three Midway-class carriers. Two additional CVANs, therefore, still remain to be built. The estimated cost of the Nimitz has risen 28 percent over last year's estimate (\$428 to \$544 million) and will amount to 96 percent more than the \$277 million cost of the Kennedy. The price for the next CVAN promises to be at least as high as the Nimitz. In order to keep the cost of the two additional CVANs as low as possible, we are considering designing all three as identical ships, permitting a savings of about \$35 million on each of the last two ships. We are also studying whether the first two can be procured under a multi-year contract, with options for a third in FY 1971—in



USS Enterprise (CVAN-65).

order to take advantage of the cost saving potential inherent in this type of procurement. Due to the exceptionally long lead times required for nuclear components, we have been able to defer the major portion of the funding for the next CVAN to FY 1970, including in this budget request additional advance procurement funds primarily to continue work on the nuclear power plant.

Carrier Aircraft. As shown in the classified table provided the Committee, the fighter inventory at end FY 1968 will total 652 aircraft, mostly F-4s and the rest F-8s. . . . As a result of our experience in Southeast Asia, we now plan to retain the F-4 squadrons in the force throughout the program period in place of an equivalent number of attack squadrons. Thus, we will have two fighter squadrons per air wing, instead of just the one squadron as planned last year. When the F-111B is introduced into the fleet, it will be used for long-range fleet air defense and the F-4 for escort of attack aircraft.

Because of the continuation of the Vietnam conflict and the retention of the F-4s in the force, we now plan to keep the production lines open beyond the FY 1968 lead time, and the procurement schedule has been adjusted accordingly. The F-111B production schedule has been adjusted as a result of cuts in our appropriation request last year. . . .

We expect to achieve our presently planned fighter force objective in the early 1970s and later, when the last of the Essex carriers are phased out, the F-8s will be replaced with F-4s and F-111Bs.

The Navy is presently studying the next generation of fighter aircraft (VFAX) for the air superiority and escort missions. The Air Force has a project (FX) for an advanced fighter. . . . The major design configurations of the FX and VFAX (e.g., size of crew, amount and type of avionics and ordnance) are now being jointly studied by the Air Force and the Navy. Completion of concept formulation requirements is expected sometime in FY 1969 and is the prerequisite to a decision to proceed with contract definition. Funds have been included in the FY 1969 Budget to proceed with aircraft designs and preliminary work on the avionics and engine.

The attack aircraft inventory will total 1,076 at the end of the current fiscal year, and be composed chiefly of A-4s, A-6s, and A-7s. Since we have decided to retain two fighter squadrons per air wing, the number of attack squadrons previously planned has been reduced. Our ultimate goal will be achieved in the mid-1970s when the last A-4 squadron is phased out.

We have now extended the A-6 procurement, previously planned to end with the FY 1969 program, through FY 1970 in order to procure the aircraft needed to offset peacetime losses and hold the force level through the mid-1970s. The increased quantities now scheduled for FY 1969-70 also reflect another year of projected combat attrition.

We also propose to reduce the A-7 production program, reflecting the smaller number of attack squadrons in the present plan (the A-7 force level was reduced to compensate for the increase of F-4 squadrons) and the decision to buy a much improved version of this aircraft. . . . Although more expensive than the earlier A-7B, the A-7E's greater capabilities will allow us to reduce the squadron size from 14 aircraft to 12 while still increasing overall effectiveness. A-7E procurement was begun in FY 1967 with seven aircraft and continued in FY 1968 with 150 more. Funds for an additional increment have been included in the FY 1969 Budget.

In the reconnaissance category, current attrition projections indicate that the problem of maintaining an adequate force level will not be as serious as it appeared last year. We now believe that no additional measures will be required beyond the presently scheduled procurement of RA-5Cs in FY 1969 and FY 1970.

The major concern in the electronic countermeasures (ECM) category is again the EA-6B, an aircraft which promises significant improvements. . . . In view of the EA-6B's high cost and the increasing ECM capabilities of other aircraft, the overall procurement program has been reduced. Although advance procurement funds are requested in the FY 1969 Budget, we propose to defer further procurement until we are sure that the test aircraft bought in FY 1968 perform satisfactorily. . . .

ASW Forces

. . . Now, I would like to present the ASW force programs we propose for the FY 1969-73 period.

ASW Carriers. Last year I pointed out that the present CVS force is a relatively high-cost ASW system in relationship to its effectiveness. While the present fixed-wing S-2 is able to detect the presence of enemy submarines, it is lacking in kill capability, and the SH-3 helicopter, while efficient in locating and destroying enemy submarines, has only a limited operating range. Yet, the CVS force accounts for about 40 percent of all air ASW costs. As the newer ASW systems—the SSNs, DEs, P-3s, etc.—enter the ASW forces in larger numbers, the relative contribution of the presently equipped CVSs will continue to decline. It is clear, therefore, that if we are to continue to operate our CVS force at all, it must be modernized.

The question of whether to retain a sea-based airborne ASW capability received intensive study during the past year, and it now appears that the advantages and flexibility inherent in such a force would marginally warrant its continuation in the 1970s—provided that its effectiveness could be greatly improved. . . . Accordingly, we have decided to proceed with the development of the VSX, using the funds appropriated in FY 1968. Additional funds have been included in the FY 1969 Budget to continue the development of the engine, airframe and avionics. . . .

However, if we buy new ASW aircraft, the question of what to do about the carriers themselves immediately arises. . . . The Secretary of the Navy has considered this matter and has concluded that the best solution would be to modernize existing carriers, at an average cost of about \$50 million each. Thus, our plan to continue a CVS force into the 1970s and proceed with the development, production and deployment of the VSX is based on the assumption that no new ASW carriers will be required. Indeed, if new ASW carriers were needed, increasing the number of landbased ASW patrol squadrons would be much more attractive alternative than the VSX.

The future CVS air group, as seen by the Secretary of the Navy, will consist of VSXs, helicopters, and a

few fighter aircraft. E-1 aircraft may not be required, nor is development of a new type of large ASW helicopter currently foreseen.

In light of the decision to go ahead with the VSX and in view of the vast improvement in its performance vs. current ASW carrier-based aircraft, we now plan to reduce the CVS force to five carriers and four air groups when the Vietnam conflict is concluded. As additional P-3s enter the force and as the VSX replaces the S-2, the number of land-based patrol squadrons will be reduced accordingly....

Attack Submarine Forces. At end FY 1968 the attack submarine force will number 105 submarines, 36 of which will be nuclear-powered. We have continued to encounter delays in this program, principally because of the submarine safety program, and the late delivery of materials and components. As a result, we will have fewer SSNs in the force at end FY 1968 than planned last year, but we expect to make up for this shortfall in FY 1969. To offset these slippages we will retain an equal number of conventionally powered submarines.

... We now propose to start two [new SSNs] in FY 1969 and two in FY 1970 (advance procurement funds for the latter are included in the FY 1969 request). This schedule will maintain the option of continuing the SSN construction program if new conditions should warrant. The Navy is also investigating the characteristics of new submarines which may be required to meet the potential threats of the late 1970s.

In addition to the SSNs, we currently plan to retain a sufficient number of conventional submarines to maintain the force at 105 ships.

Patrol Aircraft. At end FY 1968 our authorized ASW patrol aircraft inventory will total 411 aircraft.

As more of the newer P-3Cs become available and the older P-2s are phased out, we will begin to reduce the size of the patrol force.... By the early 1970s, seven of the planned squadrons will have P-3C aircraft, the rest being equipped with earlier P-3 models.... Funds are included in the FY 1969 Budget to continue procurement of these aircraft.

Sonobuoys. The effectiveness of ASW aircraft is heavily dependent upon the availability of sensitive and accurate sonobuoys.... One of these

new devices, DIFAR, is now completing development and has demonstrated a major improvement in our localization capability. Funds to initiate production are included in the FY 1969 Budget. We also plan to continue procurement of the Julie/Jezebel and SSQ-47 sonobuoys and proceed with the development of an improved version of the SSQ-47.

Torpedoes. Although we are still experiencing some production difficulties with the MK-46, the new surface ship/air-launched ASW torpedo, by the end of this fiscal year the MK-46 will constitute a large percentage of our lightweight ASW torpedo capability. More of these torpedoes will be bought in FY 1969.

Fleet Escorts

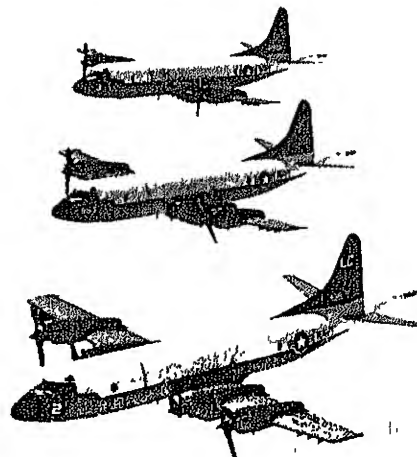
During the last year we have intensively restudied the entire fleet escort force requirement. As a result of this study we now have a much better understanding of the numbers and types of escorts the fleet will need in the mid-1970s for antisubmarine warfare (ASW) and anti-air warfare (AAW). One of the major conclusions we have drawn from this study is that the ASW requirement should be the determining factor in computing the size of the escort force.

Taking this factor into account, we first computed our escort require-

ments on the basis of conventionally powered ships only. We determined the number of escorts required for each type of basic force—attack carriers, ASW carriers, amphibious groups, etc. Then we determined how many escorts should have an AAW as well as an ASW capability. These total “on-line” requirements plus an allowance for ships in overhaul gave us the total required by type, which are summarized in the classified table provided to the Committee.

In this calculation, the attack forces are provided the more capable 30-knot ASW/AAW and ASW escorts, since they represent the highest value target in the fleet. In the case of the “Advance” and “Assault” Amphibious Groups, the destroyer-type ASW escorts are assigned since this mission requires fire support as well as protection against enemy submarines. And, in view of the enemy’s mid-ocean submarine-launched cruise missile threat to underway replenishment and amphibious groups, we now believe that missile-capable escorts should be included in each of these groups. Since amphibious groups will not be employed continuously, escorts allocated to this role can also be used for military convoys.

To meet the merchant ship convoy requirement, we plan to rely on the large number of escort ships in our



U. S. Navy P-3C aircraft.

reserve fleet and in the naval forces of our allies. . . . For example, Naval Reserve Training escorts which are kept in a high state of readiness could be available almost immediately, Category Bravo Naval Reserve ASW destroyer types could be activated, and there will be a large number of other destroyer types in the Category Charlie Reserves throughout the program period. Moreover, our allies have about 400 destroyer-type ships in their active fleets.

The new study, however, indicates that because of their capability for sustained high speed, four nuclear-powered ASW/AAW ships can take the place of six conventionally powered ships (three ASW/AAW and three ASW) in escorting a nuclear-powered attack carrier task force. The fact that the all-nuclear group can achieve the same degree of protection with fewer escorts helps to offset the substantially higher cost of nuclear ships. In spite of these savings, the all-nuclear force is still more expensive than the conventional force. However, we have already paid for four nuclear escorts. With these in hand, we need to build only five more to have two all-nuclear task groups. We believe we can build and operate these five nuclear ships for about the same cost as building the 10 new conventional escorts it would take to give the two carrier task groups the same degree of protection. This factor, taken together with the logistic economics inherent in all nuclear-powered escort forces, makes the nuclear-powered more competitive with the conventionally powered escort for certain purposes. Accordingly, we propose to provide two of the CVANs with nuclear-powered escorts. . . .

The proposed new escort ship program, entailing an investment of about \$3 billion, presents us with a unique and more important opportunity to effect a major advance in the management of the Navy's shipbuilding and operating programs, ranging over the entire life cycle of ships—from design and development to construction, supply, maintenance and operation. All three classes of ships involved will have essentially the same operating profile and many of the same characteristics. By planning their procurement with the specific aim of achieving maximum efficiency and economy through com-

monality (except where the classes have to be different), we can not only save money, but also produce a more effective escort force through standardized training, better availability of spare parts, ease of modernization, etc.

Certainly, within each of the three classes, we can build identical ships. While each class of ship will differ somewhat in overall length and displacement, we expect them to have essentially the same internal and external arrangement and outfitting, the same navigation and communications systems, and virtually the same ASW and gun systems. Propulsion and machinery systems could also be common to the conventionally powered destroyers and guided missile ships, and the missile systems could be common to both the conventionally and nuclear-powered missile ships. . . .

Last year I described to you a new DX/DXG shipbuilding program intended to achieve the following objectives:

- Minimum total procurement cost through standardized design and serial production of large quantities of identical ships.
- Lower operating costs through design emphasis on automation and reduced manning levels.
- Increased reliability and reduced cost of repair, maintenance and logistic support through standardization.
- Maximization of the advantages of standardization and serial production through commonality between the DX and DXG wherever possible and economically feasible.
- Faster and cheaper construction and modernization or maintenance through the use of modular design of major component systems (e.g., weapon systems).

Now, in the light of the new requirements study, we have refined our concept of the desired characteristics of these ships. Whereas the DX had originally been envisioned as merely a more economical replacement for our present DE construction program, it now appears that this ship should be a larger, faster destroyer type. The DX now envisaged would be heavier than our present DEs and be fast enough to escort our attack carriers. It would also have guns for gunfire support missions, and a Basic Point Defense (Sea Sparrow) missile

system for close-in air defense as well as the latest ASW equipment.

The DXG would be somewhat larger with the same speed and endurance, and for air defense it would have the new, more capable Tartar D system, which employs new fire control and search radars and the Standard missile. However, because it is the ASW rather than the AAW requirement which is controlling, we plan to install only one Tartar D system on each DXG. . . .

The DXGN would simply be a nuclear-powered version of the DXG and would be somewhat heavier.

It is worth noting that one of the FY 1968 DEs will be powered by a gas turbine engine which promises great improvements in economy and efficiency. We will consider the use of a similar power plant in the DX and DXG.

As I stated last year, we are going ahead with the construction of the FY 1967 DLGN. However, we now propose to include the FY 1968 nuclear-powered escort in the new DXGN program so that we can build five ships of the same class. . . . Accordingly, it is proposed that the FY 1968 DLGN be reprogrammed as the first DXGN and started when contract definition is completed. The remaining four DXGNs are programmed two in FY 1970 and two in FY 1971.

Funds are included in the FY 1969 Budget for five DXs, for advance procurement of long lead time items for the two DXGNs to be started in FY 1970, and for contract definition of the DXGN and the DXG. (Contract definition of the DX was funded in FY 1968.)

The missile ship modernization/conversion program is the same as I presented last year, except that we have rephased the program somewhat. Inasmuch as all of these conventionally powered cruisers will be retired by the mid-1970s, we have dropped the cruiser modernization previously planned for FY 1969. Funds are included in our FY 1969 request for one frigate conversion and for advance procurement for three more DLG conversions scheduled for FY 1970. The last five DD-931 class ASW modernizations are now scheduled for FY 1970-71.

Last year we began procurement of the Basic Point Defense Surface Missile Systems (BPDSMS). . . . An

Advanced PDSMS is currently in concept formulation, with contract definition tentatively scheduled for FY 1971. Additional funds are included in the FY 1969 Budget to continue procurement of the Basic PDS MS.

Amphibious Assault Ships

Last year we proposed to construct a new large amphibious assault ship, the LHA, which together with one or two LSTs could put ashore (by helicopters or boats) an entire Marine Corps battalion landing team, a job which now requires five amphibious ships. However, the Congress felt our request was premature in view of the uncertain state of the LHA's design, and the procurement funds were stricken from the budget. We have, in the meanwhile, proceeded with the contract definition phase for this ship, letting contracts to three firms. We expect to receive the proposals in January, and we should be ready to award a multi-year, total package procurement contract for the entire program early in FY 1969. Accordingly, funds for the first LHA and advance procurement of long lead time items for the next increment are included in the FY 1969 Budget.

The only other new construction remaining to complete our goal of a 20-knot lift capability for one and one-half Marine Corps division-wing teams is several more LSTs now scheduled to be funded after FY 1969. The Amphibious Force Flagship (A GC), which was tentatively scheduled last year for FY 1969, has been deferred to FY 1970, to permit the Navy to complete an extensive study of amphibious command and control requirements and to allow us to explore the possibility of modifying the AGC's design so that it could be used as a fleet commander's flagship as well as an amphibious force flagship. (The present fleet flagships are cruisers scheduled for retirement in the 1970s.)

Fire Support Ships

As I mentioned last year, the Navy is designing a new fire support ship (LFS) which would combine in one hull the accuracy and destructiveness of large caliber guns and the saturation fire of rockets. This ship could replace the gun cruisers, which are old and extremely expensive to operate, and the slow, old rocket ships.

Funds are included in the FY 1969 Budget to initiate contract definition of the LFS.

Mine Countermeasure Force

As you know, last year we began a major rehabilitation program for all the existing ocean minesweepers (MSOs) designed to increase their effectiveness and add 10 years to their useful life at about half the cost of new construction. The first 9 MSOs were funded this year, and we have tentatively scheduled 10 more each year until the program is completed. The FY 1969 request, therefore, includes funds for 10 MSOs and advance procurement for 10 more.

The last of the planned new-construction MSOs were funded in FY 1968, and the first one will enter the force by end FY 1970. To complete the modernization of our mine countermeasure forces, we plan to build two more mine countermeasure support ships (MCSSs). We presently have three, one of which has only a limited capability and is scheduled for retirement. While concept formulation is currently under way on these ships, we have decided to defer the program until FY 1970-71, when their characteristics will be better defined.

Logistic, Operational Support, and Direct Support Ships

We now plan a force of 210 ships in this category (Underway Replenishment, Fleet Support, Special Combat and Small Patrol) at the end of the current fiscal year and 222 at end FY 1969. In future years this number will drop slightly as a result of the delivery of the new, more effective underway replenishment ships which replace older ships on a less than one-for-one basis; and the reduced support requirements resulting from the decline in the size of the CVS force (after the termination of the Vietnam conflict); and the introduction of additional nuclear-powered surface ships.

We also propose to build 10 all-weather patrol boats (PBs) of a new type for use with the River Assault Squadrons in the Mekong Delta; nine will be procured with reprogrammed FY 1968 funds and the tenth is included in the FY 1969 budget request.

In order to take advantage of modern resupply methods and match

the higher speeds of our latest ships, we plan to continue our long-range construction program to modernize the underway replenishment fleet.

In the Fleet Support category, funds are requested for one destroyer tender (AD) in FY 1969.

Marine Corps Force

The Marine Corps land forces shown in the classified table provided to the Committee are essentially the same as those projected last year, except that the temporary Vietnam-related deployments are extended through FY 1969.

With regard to the Marine Corps air wings, we plan to maintain the F-4 force throughout the program period at the current level. (The last few squadrons of F-8s will phase out by the end of this fiscal year.) Because of the significant improvements in payload, accuracy and effectiveness already achieved and currently programmed, we no longer plan to replace A-4s with A-7s. . . . The planned force level of A-6 aircraft will be achieved in FY 1969.

In the Reconnaissance/ECM area, the major change is the decision to procure EA-6A electronic warfare aircraft instead of EA-6Bs. Since the Congress has already provided funds in the FY 1968 Budget for this purpose, we are now proceeding with the procurement of EA-6As.

The Marines' tactical air control forces will remain at approximately the same level, although we plan to change their internal composition when the Vietnam conflict ends in order to make the best use of the aircraft available. The Air Force should have surplus O-2s available at that time for transfer to the Marine Corps to replace their present TA-4s. These TA-4s could be used by the Navy for advanced jet training instead of procuring new trainers at a cost of about \$60 million.

Last year, we planned a permanent force structure of five medium (CH-46) and one heavy (CH-53) helicopter squadrons for each of the three air wings. We now believe we should plan four medium and two heavy squadrons per wing, which will provide the same lift capability at a lower cost. . . . The FY 1969 procurement program for the CH-46s and CH-53s reflects this shift in emphasis.

Experience in Vietnam has shown that the Marine Corps required improved fire support during air assault operations, especially for close-in suppression around landing zones. While we expect that the OV-10s now entering the force will be more effective than current fixed-wing aircraft in this role, we are also proposing procurement of AH-1G Huey Cobras in the FY 1969 Budget to provide a more effective armed helicopter and to replace losses of UH-1E observation and reconnaissance helicopters now used in the armed helicopter role.

Navy and Marine Corps Reserve Forces

The Navy will continue to maintain about 50 ships in the highly ready Naval Reserve Training Fleet (NRT). As more modern ships become available from the active forces, older NRT ships will be phased out.

The Navy also maintains a large number of inactive ships in the reserve, designated either Category B (Bravo) or Category C (Charlie) according to their physical condition and urgency of need upon mobilization. . . .

In addition, the Maritime Administration maintains a large number of ships (mostly noncombatant types) in the National Defense Reserve

Fleet to meet potential Navy needs during wartime. It also maintains a reserve of merchant ships, which I will discuss later in connection with the Airlift/Sealift Program.

The Naval and Marine Corps Reserve fighter and attack units will have about 355 aircraft by end FY 1969, and they will be maintained at this level through the program period. . . .

Air Force General Purpose Forces

The composition of the Air Force's General Purpose Forces are shown in the classified table provided to the Committee. Again, let me remind you that the aircraft data refer to the total authorized active inventory (AAI).

Fighter and Attack

In the case of the fighter/attack aircraft, we are attempting in the near term to tailor the composition of the force structure and the procurement program to the changing demands of the Vietnam conflict. Over the longer term, our goal remains the same as in the past—a balanced force whose capabilities span the entire range of possible requirements.

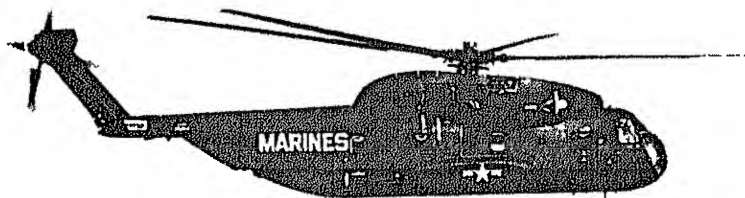
Last year our long term force objective called for 24 aircraft wings equipped with F-4s, F-111s and A-7s. Now, however, as mentioned earlier in the discussion of the Navy's program, we plan to incorporate a new avionics system in the A-7. This system will so increase the A-7's bombing accuracy, that we believe we can eliminate one of the originally planned A-7 wings and still achieve an overall increase in the target destruction capability of the A-7 force. Accordingly, the longer range goal has been reduced to 23 wings, and the A-7 procurement program has been adjusted to reflect this reduction and a somewhat slower force buildup.

No change is presently envisioned in the ultimate size of the F-4 force. Tentatively, we plan to modify the avionics of the early model F-4s in order to improve their ground attack capability, and funds have been included in our FY 1969 request for the necessary development work. The F-4 procurement program has been adjusted on the basis of our latest attrition experience.

The first F-111 squadron will be operational by March 1968. We have decided to build up the F-111 force somewhat more slowly than planned last year in order to permit a more orderly phase-in of the "D" model. . . .

With respect to the F-105, lower-than-expected attrition will permit us to support a larger number than anticipated in the active force during FY 1968 and FY 1969. We now plan to retain several more squadrons in the force than formerly projected to offset the slower phase-in of A-7s. All of the B-57s will phase out of the force by end FY 1969 as scheduled.

For the more distant future, the Air Force will most likely require a replacement for the F-4 beginning some time in the latter part of the 1970s. As previously mentioned in connection with the Navy's program, funds have been included in our FY 1969 request to finance the Air Force's share of the joint FX/VFAX development program. The Air Force may also, ultimately, need to replace the A-7 with an aircraft especially tailored for the close support role. This requirement, however, is less certain. The FY 1969 Budget includes funds to support preliminary work on the long lead time subsystems which such an aircraft would require.



U. S. Marine Corps CH-53A heavy assault transport.

Tactical Reconnaissance

Last year our long-range objective for the tactical reconnaissance force included only the RF-4s and RF-101s. However, we had also tentatively planned to procure palletized reconnaissance packages which could be installed in the F-111, thereby giving it a reconnaissance capability. We now propose to procure a few squadrons of RF-111Ds specifically committed to the reconnaissance mission. . . . Development of the equipment is now under way and additional funds have been included in the FY 1969 Budget to continue the program.

The force structure for the RF-4 remains the same as projected a year ago. Lower-than-expected losses for the overall reconnaissance force, however, have permitted us to reduce the FY 1968 procurement program, but another year of projected attrition will require additional procurement in FY 1969-70.

Last year we had tentatively planned on keeping several squadrons of RF-101s in the active force structure and had scheduled the conversion of a number of F-101s to the reconnaissance role in FY 1969 so as to be able to maintain that force. With the introduction of the RF-111s, we now feel that all of the RF-101s (except those used for test purposes) can be phased out of the active structure. And, as a result of lower attrition, the planned of F-101 conversions has now been reduced.

Tactical Electronic Warfare Support (TEWS)

TEWS aircraft provide the tactical forces with specialized capabilities for active and passive electronic countermeasure operations, airborne radio direction finding, and paramilitary communications countermeasures. No change has been made in the EC-47 program from that shown a year ago, although we are adding some more EB-66s this year.

Night Warfare

The rising importance of night operations in Southeast Asia, coupled with the recent availability of improved illumination and sensing devices, has led us to create a special Night Warfare category in the tactical forces. By the end of the current fiscal year we will have a number of C-130s specially modified and equipped for this mission. . . .

Special Air Warfare (SAW) Forces

For post-Vietnam planning purposes, we are tentatively projecting a peacetime SAW force (in the active structure) consisting of C-128s, C-130s, U-10s and A-37s. This force would provide a quick reaction capability to meet one major counterinsurgency situation, an organizational base for expansion in a future emergency, and a mechanism for testing new concepts, tactics and equipment. The Vietnam-augmented SAW force is now scheduled to grow by about 10 percent in FY 1969.

Because of the large transfer of A-1s from the Navy to the SAW force, the buildup of the A-37 force to its planned level need not be achieved as early as previously planned. This, in turn, has enabled us to stretch out the procurement of A-37s, deferring a number of the previously planned FY 1968 quantity until FY 1969. This will provide a "hot" production line for a longer time, giving us the option of buying more aircraft later if that should prove necessary.

Tactical Air Control

The long-range peacetime Tactical Air Control force is tentatively scheduled to consist of OV-10s and CII-8s. Presently the forward air control element of the force, augmented to meet the needs of the Southeast

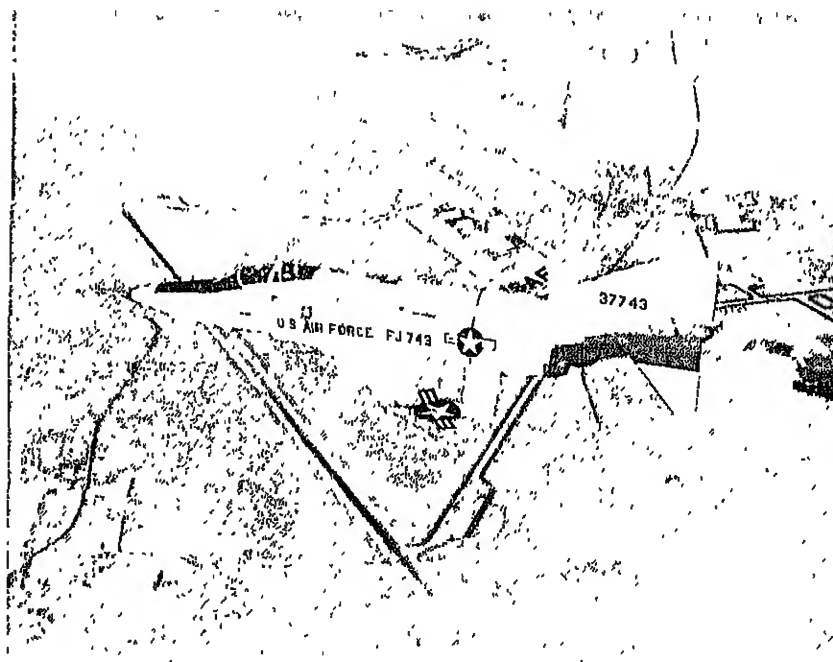
Asian conflict, consists primarily of O-1s and O-2s. The stepped up pace of operations in 1967 has generated a 10 percent increase in requirements for forward air control. To meet these needs, we increased our FY 1968 procurement of O-2s, and in FY 1969 we propose to buy additional aircraft. The O-1 aircraft are scheduled to phase down in FY 1969 as the OV-10 force reaches its programmed strength and both the O-1 and O-2 will phase out completely after the conflict is over. The EC-135s, also a part of the temporary Vietnam augmentation, are employed as airborne command and control aircraft to help coordinate strikes over North Vietnam. They will be dropped from the force when this mission is over.

Tactical Missiles

The 18 Mace B missiles in Germany will be phased out on schedule during FY 1969 as Pershing takes over the quick reaction alert role. The rest of the Mace B force is currently scheduled to be retained in the force, at least for the next few years.

Air National Guard

The long-range peacetime force structure objective for the Air National Guard's fighter force has been adjusted on the basis of our



U. S. Air Force RF-4C aircraft.

most recent attrition data. As currently planned, the force will be composed of 4 F-105 and 19 F-100 squadrons. However, since we must now plan on retaining more F-100s and F-105s in the active force to help support another year of combat in Vietnam, the Guard's buildup will be delayed commensurately. To help offset this delay, the Guard will retain the F-84s, F-86s and F-104s somewhat longer than previously planned.

We now plan to build the Guard's reconnaissance force from the present level of 208 aircraft to 223 aircraft by the end of FY 1971, phasing in RF-101s from the active force and retiring the RF-84s. The Guard's SAW force presently consists of about 60 aircraft (C-119s, HU-16s and U-10s) and is tentatively scheduled to remain at about this level throughout the program period. Eight EC-121s being transferred to Guard operations in FY 1968 will provide a reserve capability for tactical electronic warfare.

As you know, nine F-100 squadrons, four RF-84 squadrons and one Tactical Air Control unit of the Air National Guard have been authorized additional manning and training so that they can maintain a very high level of combat readiness. We propose to continue this program through FY 1969.

Theater Air Base Vulnerability

Over the past year, the great importance of adequate protection for air bases and aircraft in forward areas has again been dramatically demonstrated in the Middle East and in Southeast Asia. In a few hours of lightning strikes against the Arabs' unprotected air bases and aircraft on June 5, Israel annihilated the Arab air forces and achieved absolute air superiority in the combat zones for the duration of the six-day war. Moreover, in South Vietnam, where enemy hit and run mortar attacks against U.S. air bases have continued, the passive defensive measures we have taken have greatly reduced the potential losses.

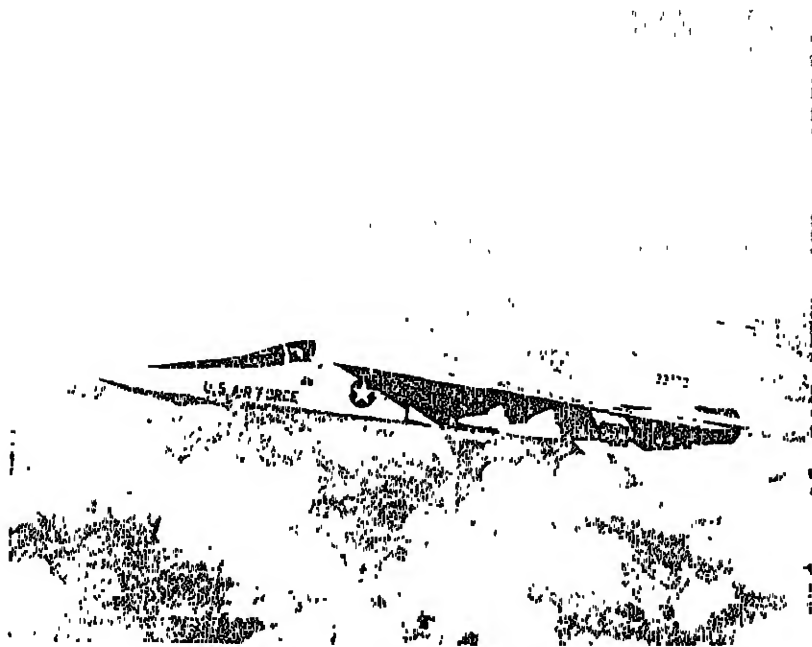
The reduction of an air base's vulnerability involves such diverse measures as aircraft revetment or sheltering, rapid runway repair, the hardening of POL and communications facilities, camouflaging, and improved perimeter defense for the base itself. In South Vietnam where the principal threat is from mortar and rocket attacks, revetments have been provided for all our tactical aircraft, and rapid runway repair kits have been in use for two years. Steps have also been taken to increase perimeter security. In Thailand, all the B-52s have been revetted, and all tactical

aircraft will be revetted by the end of the current fiscal year.

In situations such as South Vietnam, where the enemy has not demonstrated a capability for air strafing and bombing, revetments alone may be adequate against the residual threat of intermittent rocket or mortar attacks. But for our other overseas bases, particularly those in Europe, where the enemy poses a strong air threat, roofed shelters are required to give adequate protection against aircraft attack. As I mentioned in former years, the Air Force has developed and successfully tested a prefabricated metal and earth-mounded shelter which would provide excellent protection against anything but a direct hit by a conventional bomb, and some protection in a nuclear attack. These shelters would cost between \$130,000 and \$160,000 (depending on whether they were equipped with blast resistant steel doors)—only a fraction of the value of the aircraft they would protect—and together with the active defense by our Chaparral and Hawk missiles and our Vulcan guns would provide a strong integrated defense for our overseas aircraft.

Thus far, while the Congress has appropriated funds for runway repair materials and equipment for various physical security measures, our past requests for aircraft shelter construction have been denied. This reluctance to make fixed investments overseas has, no doubt, been related to recent uncertainties with respect to the size and location of our future overseas deployments. In Europe, those uncertainties have now been eliminated as the effects of the relocation from France have been absorbed.

Consequently, we believe that our tactical aircraft basing plans for Europe are now reasonably firm for the foreseeable future. We are, therefore, again requesting funds (\$17.4 million) for the Theater Air Base Vulnerability Program in FY 1969. These funds will provide 60 shelters at European bases. As presently planned, the total program would provide shelter for 515 aircraft together with a complete complementary set of other vulnerability measures. I strongly urge Congress to approve the FY request.



U. S. Air Force F-111 aircraft.

Airlift and Sealift Forces

The Airlift and Sealift Program comprises: the Military Airlift Command's strategic airlift aircraft; the Air Force's tactical airlift aircraft assigned to the Tactical Air Command and the Unified Commands; the transport and tactical airlift aircraft in the reserve components of all the Services; certain cargo and transport aircraft of the Navy and Marine Corps; specialized transportation forces, such as aeromedical evacuation units and aerial port squadrons; and the troop ships, cargo ships, tankers and "Forward Floating Depot" ships operated by the Military Sea Transportation Service (MSTS).

Last year I noted that the lift mission consists of two principal tasks: the strategic requirement for transportation support of overseas military operations, and the tactical requirements for intra-theater and assault airlift.

Strategic Movement

* * * * *

As I noted in the preceding section of this statement, the most demanding contingency which we use for planning our forces is a rapid deployment to Southeast Asia to counter a conventional attack and a simultaneous reinforcement of our forces in Europe. We have, therefore, used this case to test the relative effectiveness of the Fast Deployment Logistic (FDL) ship force and its principal alternatives in the rapid response role in the projected environment of the mid-1970s. In such a serious situation, it is reasonable to assume that the U.S.-owned commercial fleet would be requisitioned and available without delay. However, in more limited contingencies, this would not necessarily be true, nor would it necessarily be desirable. Accordingly, we have also examined the requirements for such a more limited contingency.

After testing a wide range of various combinations of airlift, sealift and prepositioning, we have found that the force which give us the required capability at the least cost consists of: six C-5A squadrons, 14 C-141 squadrons and 80 FDLs; prepositioned equipment in Europe

and in the Pacific; a Civil Reserve Air Fleet; and 460 commercial general cargo ships.^a

However, we have also examined three variations of the recommended force:

- The force without the FDLs.
- The force without the FDLs, but with more privately owned and operated merchant ships which would normally be employed in commercial liner service and subsidized in the amount of the FDL program cost.
- The force without FDLs, but with an enlarged MSTS-controlled fleet obtained by long-term charter (at a cost equal to the FDL program) of privately owned and operated vessels designed specifically for military cargo and used exclusively for defense business in peacetime as well as wartime.

Under the first alternative—no FDLs—we would not be able to respond as fast as we would wish in the first few weeks of a combined European/Southeast Asian contingency. The significance of a prompt response was illustrated by our experience in the Korean war, where we came close to being pushed off the Korean peninsula before we were finally able to stem the attack and secure a beachhead for later reinforcement. What prevented this from happening was the availability of three U. S. divisions in Japan. After North Korea invaded the South on June 25, 1950, we were able to move the first of these divisions into action by D+14 and two additional divisions by D+23. However, the first division deployed from the continental United States to Korea did not arrive until D+56. We managed to build up to five divisions (although understrength and without substantial support elements) by D+60 and seven divisions by D+70.

Under the second alternative—an enlarged subsidized merchant fleet—we would be able to respond somewhat faster but not fast enough to meet the desired schedule. Moreover, dependence on commercial shipping

^a These are "national" ships with a capacity of 15,000 measurement tons, a speed of 15 knots, a five-day load or unload capability and 10,000 round-trip distance factor.

would mean deployment of our forces in piecemeal fashion because the ships employed would be too small to preserve the unit integrity of troops and equipment. This shortcoming is important because unit integrity largely determines the military effectiveness of the first combat forces arriving in the theater of operations.

In contrast, 12 FDLs would lift an infantry division's equipment with its initial support increment and necessary supplies, while it would take 33 C-5 type ships (the largest commercial cargo ships being built today) to do the same job. Moreover, the FDL force will carry its own lighterage and helicopters for moving the equipment ashore rapidly wherever needed, even in the absence of port facilities. The FDL will also carry sufficient POL to fuel all vehicles before discharge, thus facilitating their rapid exit from port or beach and avoiding confusion and delay in the supply line.

The third alternative—the long-term charter of private ships—while better than the first two, would still not fully meet the desired schedule. Because these charter ships would be used in regular peacetime service, carrying defense cargo, they could not offer the same responsiveness as the FDLs.

Thus, neither of the two equal cost alternatives to the FDL force can do as well in meeting the requirements of a rapid deployment strategy. Moreover, the kinds of ships which they would employ lack many of the functionally unique operating characteristics which make the FDL ideally suited to the rapid response mission.

One objection that has been raised to the FDLs is, in fact, an objection to any kind of rapid response capability. The argument has been made that because of the rapid response capability provided by the FDL, we would be tempted to intervene in many situations where our long-range best interests would dictate otherwise. I want to emphasize that the FDLs, per se, would in no way add to or subtract from our commitments. But as long as we adhere to a policy of fulfilling our treaty commitments, we should be prepared to do so with the minimum political and military risks and the minimum cost in lives—that is why the FDL program is unanimously recommended to the Congress by the Chiefs and the Secretaries of

each of the Services, as well as by Mr Nitze and myself.

As you will have noted from the foregoing discussion, even with the FDLs, we would need a substantial assist from the U. S. commercial fleet in order to meet the rapid response requirement. Last year, as a result of our Vietnam experience, I discussed at some length our concern about the availability and cost of such shipping in future emergencies. Subsequently, the Committee of American Steamship Lines, representing most of the subsidized U. S. Merchant Marine, proposed a new program which would guarantee that emergency sealift to meet defense requirements would be made available according to predetermined arrangements. Encouraged by this industry initiative, we have continued to study the problem, working with industry, the Department of Transportation, the Federal Maritime Commission, and the Maritime Administration. Using the original industry proposal as the starting point and adding the best of the proven features of the Civil Reserve Air Fleet (CRAF) program, a new plan was developed.

This plan, known as the RESPO ND Commercial Sealift Augmentation Program, is designed to ensure timely sealift augmentation from commercial sources in future emergencies according to prearranged contractually defined commitments, administrative arrangements and prices. It is based on three fundamental concepts. First, as originally proposed by industry, a prior commitment to provide emergency sealift augmentation would, in the future, normally be a prerequisite to sharing in the award of defense peacetime business. Second, a cost-based rate schedule for Defense Department cargo would be established for each trade route. Finally, defense cargos would be allocated so as to reward both the operator's efficiency and his mobilization commitment. However, within this broad framework, there is still a considerable amount of work to be done in developing specific procedures. To this end we are currently engaged in joint studies and consultations with industry looking toward partial implementation of the program in FY 1969, with full implementation to be completed in time for the award of contracts on the new basis in FY 1970.

Tactical Movement

Within the theater of operations, equipment and supplies are moved by a variety of means, only one of which, intra-theater airlift, need concern us here. For a number of reasons, the requirement for this type of lift is particularly difficult to establish with any degree of precision.

Our approach to this problem has been, essentially, to analyze our present capabilities and compare them with possible intra-theater lift requirements in the same contingency situations which we use to establish our General Purpose Force and strategic lift requirements. Intra-theater airlift serves two major missions: support of the air line of communications, i.e., the air movement of equipment, supplies and personnel within the theater of operations; and the tactical movement of combat units with their equipment in areas where road or rail transportation is not available. With respect to the first mission, about one-fourth of all equipment and supplies being moved within Vietnam today go by air—earlier in the war, it was one-half. With respect to the second mission, about one-tenth of the tactical airlift missions are for combat unit movements (i.e., the equivalent of moving one battalion per division per week).

Our study shows that about half of the aircraft in the planned C-130 force could support simultaneously the two separate contingencies postulated earlier. The rest of the planned C-130 force would provide a capability to handle minor contingencies, to support allied forces, and to support deployed Navy and Marine Corps forces. The C-141s, of course, can also be used for intra-theater and airborne operations, and adequate shortfield capabilities are provided by the presently planned force of C-7As and jet-augmented C-123Ks.

Thus, on the basis of our present understanding of the requirement, it does not appear that any additional intra-theater airlift capability need be procured at this time.

Air Force Airlift

The airlift forces currently planned through FY 1973 are shown in the classified table furnished to the Committee.

Active Forces

In the active forces, the planned deployment schedules for the C-5A remains the same as a year ago. . . . Funds are included in the FY 1969 Budget for another 27 C-5As.

By end FY 1968, the C-141 force will reach its planned strength of 14 squadrons.

As previously mentioned, one-half of the present C-130 force should be able to provide an adequate intra-theater airlift capability in the active force. Therefore, we plan to start phasing large numbers of the older C-130s into the reserves in FY 1970, and by end FY 1973, the active force will consist of 14 squadrons of the "E" model, plus one squadron of the ski-equipped C-130Ds. Thirteen of these C-130E squadrons will be modified with the Adverse Weather Aerial Delivery (AWAD) radar system to give them an accurate night and all-weather airdrop capability. We did consider once again the question of procuring additional C-130Es in view of the Congress' appropriation of funds for this purpose last year. However, the present inventory, as re-equipped, should be able to meet all important needs into the mid-1970s, when we may want to introduce a new intra-theater transport. To this end, the FY 1969 Budget includes funds to start contract definition of a Light Intra-theater Transport (LIT) to provide an appropriate replacement for the C-123 and the C-7A aircraft in the mid-1970s.

In order to retain more outsize cargo capability during the early stages of the C-5A force buildup, we now plan to hold two C-124 squadrons in the force a year longer than previously scheduled. And, to augment the capability of the active force to operate from short airfields, we tentatively plan to transfer several squadrons of the jet-augmented C-123Ks from the Special Air Warfare forces to the regular airlift force structure.

Air Force Reserve

The FY 1967 Supplemental Appropriation Act directed that Air Force Reserve continue to maintain a force of 40 troop carrier and airlift groups through FY 1968, and this will be done. For the future, however, I am convinced that the structure of the

Reserve's airlift force should be determined solely by our military requirements and the most efficient use of all our airlift resources, including our skilled Reserve personnel. As a result, we have made a number of changes in the forces planned for FY 1969-1973.

The most significant of these is not reflected on the force table. The C-141/C-5A force, which we have programmed for the early 1970s, will be capable of considerably higher daily utilization rates in an emergency, providing the additional crews and support personnel can be made available. Thus, if reserve component skills could be used to raise the sustained utilization rate of our most modern transport (which are in the active forces), especially in the crucial early days of an emergency, this would be potentially far more valuable than the contribution of reactivated reserve units equipped with older, less efficient aircraft. In order to test this concept, we are converting a former C-119 group to a C-141 "associate" unit which will train with the aircraft in an active squadron. If this test proves successful, it will give us a good way to maintain and capitalize on the skills of our reserve component personnel without having to retain costly inefficient older aircraft in the structure. Accordingly, we have tentatively scheduled the conversion of four more C-119 squadrons to "associate" C-141 units in FY 1969.

In order to prepare for the introduction of C-130s into the reserve, a special dual-purpose squadron of eight aircraft is being created this year, using the personnel of two former C-119 units. This squadron will provide combat crew training for both active and reserve personnel and at the same time constitute a reserve airlift unit capable of mobilization if needed. Thus, the C-119 force will be kept at 18 squadrons through the end of the current fiscal year, phasing down to 10 by end FY 1969 and out of the structure completely the following year. Thirty-six Air Force Reserve squadrons are retained through FY 1969 as follows: 10 C-119, 19 C-124, 5 C-141 (associate), 1 C-130 and 1 C-130A CCTS without aircraft.

The first large quantities of C-130s would be received by the Air Force Reserve in FY 1970 as the force

builds to five squadrons, replacing C-124 squadrons. In FY 1971-73 the remaining C-124s would be phased out and the C-130 force built up to 13 squadrons.

Air National Guard

The FY 1967 Supplemental Appropriation Act also directed that the Air National Guard (ANG) should be maintained at not less than 25 airlift groups during FY 1968, and this will be done. As in the case of the reserve, however, the ANG's future airlift force structure should be determined by the test of military need.

Of the 26 airlift groups in the ANG structure at the end of FY 1967, three were C-124 units and one was a C-123 unit which are scheduled to remain in the force for the next few years. Five were C-121 groups which will all be converted to aeromedical evacuation or tactical electronic warfare missions—two in FY 1968 and three in FY 1969. Seventeen were C-97 units, which we plan to phase down to 11 by end FY 1968, to six by end FY 1969 and out of the force completely in FY 1970. However, the six being phased out this year are being converted to C-124 groups, giving us a total force of 26 at end FY 1968, including two C-121 groups converted to other missions. In FY 1969, one more C-97 group will convert to C-124s. The end FY 1969 position will reflect 22 squadrons; 17 airlift, 4 aeromedical evacuation, and 1 tactical electronic warfare. The accelerated transfer to C-130s from the active force will allow the ANG to convert four C-97 squadrons to this aircraft by end FY 1970 instead of one as planned a year ago, with the full 12-squadron force being reached in FY 1973 as the last of the C-124s are retired.

Navy Airlift

This year for the first time we are showing the Navy's airlift elements in this program instead of the General Purpose Forces.

At end FY 1968, the Fleet Tactical Support category will consist of 86 aircraft, including C-1/C-2 COD (Carrier on-Board Delivery) aircraft, C-118s, C-130s and C-131s. In FY 1969, the present COD force will decline from 41 to 37 aircraft and

hold at that level through the rest of the program period. We believe that the 24 C-118s now in the force can be retired and their mission assumed by the Military Airlift Command; 12 would phase out in FY 1969 and, pending a review of their missions, the remainder would be eliminated the following year. Seven C-130s and 14 C-131s would remain in the force throughout the program period providing an organic non-scheduled lift capability for special Navy missions.

The present Marine Corps airlift structure consists of 71 aircraft, including C-47s, C-54s, C-117s and KC-130s. We believe that the intra-theater capabilities of the regular airlift force should be able to meet the Marine Corps' needs and, therefore, have tentatively scheduled the phaseout of all but the KC-130s for tactical aircraft and combat transport needs.

The Navy's present reserve airlift structure consists of 77 aircraft, including C-54s, C-118s and C-119Fs. We plan to phase the C-54s out of the force completely in FY 1970 as the C-118 force builds up to 50 through transfers from the active forces. Seventeen C-119Fs would be retained throughout the program period to provide an organic assault transport capability for the Marine Corps Reserve's aircraft wing.

Sealift

Following a successful contract definition competition for the Fast Deployment Logistic Ship Program, which was completed last July, the Navy is now preparing a biddable package based on the selected proposal. Assuming Congressional authorization of the program late this spring, negotiations will be conducted with the contractor whose proposal was selected. If these negotiations are successful, a contract could be ready for award promptly after final Congressional appropriation action. If unsuccessful, the entire biddable package would be offered to the industry at large. Funds for four ships are included in the FY 1969 request, and we tentatively plan on 10 more in FY 1970 and eight in each of the two following years. Under the revised schedule the first four FDLs would enter the force in FY 1972, with subsequent deliveries being made at the rate of one a month.

Research and Development

Included in this major program are all of the research and development efforts not directly identified with weapons or weapon systems approved for deployment. I have already discussed some of the more important research and development projects earlier in this statement, in connection with the military forces they support. Dr. Foster, the Director of Defense Research and Engineering, will discuss the details of the program later. What I would like to do now is to concentrate on some of the larger and more fundamental problems involved in this area of the defense effort.

Overall Policy Matters

In the seven fiscal years, 1962-68, we have devoted a total of \$47 billion in new obligational authority to research, development test and evaluation, and we are requesting \$8 billion for this purpose in FY 1969. These amounts include not only the cost of research and development projects in this major program, but also the continuing development costs of systems already approved for deployment and, therefore, included in other major programs. Nevertheless, these are very large sums and the trend over the years has been rising, as has been the case in Federal research and development expenditures, generally. Thus, the interest of the Congress in this program is quite understandable. . . .

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After examining all the evidence in this area for some years, I believe we should be willing to give first priority in the research and development program to a reasonable, sustained level of research spending, taking into account the inevitable price and wage increases from year to year. During FY 1965-68, after adjusting for inflation, Research funding declined. But it is quite clear that we must now reverse this trend and support more vigorously many scientific fields that show great promise and clear relevance to our future security. It is on this basis that I have recommended a total of \$450 million

for Research in the FY 1969 Budget, \$79 million more than the amount provided by the Congress for FY 1968 but only \$37 million more than the amount available for FY 1967. The FY 1969 figure represents about a 31 percent increase over FY 1962, or an average of about four percent a year over the entire seven-year period.

The management problems involved in Exploratory Development are also complex. As I have stated to this Committee on previous occasions, I have never been fully convinced that we are getting full value from this \$1 billion a year effort. (Funds devoted to this purpose rose from \$956 million in FY 1962 to \$1,158 million in FY 1964 and have since declined to about \$948 million in the current fiscal year.) . . . Although this area of work is also subject to rising price and wage levels, I am not sufficiently confident that we have a coherent enough grasp of the overall program to recommend an increase commensurate with the rise in costs. Accordingly, I am recommending a total of \$980 million for Exploratory Development in FY 1969, approximately the amount originally requested for FY 1968.

It is extremely important that no new major systems developments be started until the basic components and technology are in hand. This is one of the principal purposes of Advanced Development efforts. It is in this category that we develop many of the major components of new systems—engines, avionics, airborne radars, penetration aids, etc. It is also here that we develop the experimental prototypes prior to commitment to full-scale development. The V/STOL aircraft is an excellent example of both of these types of Advanced Development. During the last seven years, we have invested a total of several hundred million dollars in the development and construction of a wide variety of V/STOL prototype aircraft, using different design approaches. None of them proved to be both technically and operationally feasible. Indeed we found that, technologically, the pac-

ing item was the engine, and that until we had a suitable engine, none of the approaches were likely to produce a successful aircraft. Accordingly, beginning in FY 1966, we concentrated our resources on engine development and, through FY 1968 we devoted almost \$70 million to this project; additional funds will be required in FY 1969. Whether this engine will solve the problem is yet to be demonstrated, but at least we have resisted the temptation to embark on a full-scale development before the required technology and basic components were at hand.

Another good example is the AWACS, the Advanced Airborne Warning and Control System. . . . This radar has been under development in the Advanced Development category since FY 1966. Experiments last year demonstrated the necessary capacity for discrimination. Therefore, we are proceeding in FY 1969 with AWACS.

In some cases advanced developments turn out to be so successful that they can be moved immediately into production or even into operation. The heavy lift helicopter is a good example of the latter. Six experimental prototypes were constructed with Advanced Development funds. They proved to be so successful that when we needed such a heavy lift capability in Vietnam we were able to deploy four of these six helicopters for operational use. A somewhat different example is the Over-the-Horizon radar. The first prototype radars were fabricated under the Advanced Development program—i.e., they were procured with RDT&E funds—but they are now being used to provide an interim operational capability.

Projects in the Advanced Development category are managed on a line item basis. Each project of any significance is individually reviewed in the Office of the Secretary of Defense and individually managed by one of the Services or Defense Agencies. I believe that we have this area of the research and development program under reasonably good control. The total amount of funds devoted to Advanced Development fluctuates within a fairly wide range from year to year, as new projects

are started and older projects are dropped or moved into the Engineering Development or Operational Systems Development categories. Thus the totals shown for Advanced Development in the classified table furnished to the Committee do not reflect any meaningful trend over the years. For FY 1969 we are requesting a total of \$1,023 million for this purpose.

While Research and Exploratory Development are not directly related to immediate military requirements, a full-scale Engineering or Operational Systems Development can be justified only in terms of its potential contribution to our strategy, considering both its cost and its military effectiveness, as well as the cost and effectiveness of any other available alternatives. . . .

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Because the content of the Engineering Development category changes significantly from year-to-year as new projects are started and older projects mature, the trend in overall funding is not very meaningful. But to round out this discussion, I would simply like to mention that for FY 1969 we are requesting a total of \$856 million, compared with \$923 million in FY 1968 and \$1,011 million in FY 1967.

For Management and Support—which includes the operation of the test ranges and research and development laboratories, services provided by such organizations as Rand and Aerospace Corporation, etc.—we have included \$1,689 million in the FY 1969 Budget.

We are also requesting for FY 1969 an appropriation of \$125 million for the Department of Defense Emergency Fund, plus \$150 million of transfer authority. For many

FY 1959-64, the Congress total of \$150 million in operations and \$160 million in authority for the Emergency Fund. In the FY 1965-67 period, the appropriated amount was \$125 million, and in FY 1968, \$100 million. I believe this upward trend must now be reversed. The Emergency Fund provides the Defense Department a very substantial degree of flexibility, especially at times when our forces are engaged in combat and new, unan-

ticipated technical requirements continually arise.

As you know, we have been financing and managing the special research and development requirements of the Southeast Asia conflict through the PROVOST Program. But each year we have had to add to the amount requested for that program in the initial budget. . . . While we are requesting \$522 million for PROVOST in FY 1969, we can be sure that new requirements will arise during the year which will have to be financed from some other source. And, the most important single source of financing for such anticipated but indefinite requirements is the Emergency Fund. I, therefore, strongly urge the Committee to appropriate the full amount request for FY 1969. . . .

* * * * *

Two related general problems in the research and development program, which have apparently troubled the interested Congressional Committees for some time, are the role of the Federal Contract Research Centers (FCRC) and our expenditures for "studies and analyses," which now make up a large part of the work of some of these centers. Over the years the Committees have focused their attention on some 16 of these FCRCs. Seven of them, however, are relatively small university groups which perform essentially the same kind of research as many other Defense-sponsored university groups. The remaining nine can, in turn, be divided into three categories: Mitre and Aerospace Corporation, which are essentially Air Force systems engineering organizations; the Massachusetts Institute of Technology Lincoln Laboratory and the Johns Hopkins Applied Physics Laboratory, which are specialized research groups in the physical sciences; and the Institute for Defense Analyses (IDA), RAND, Research Analysis Corporation (RAC), the Center for Naval Analyses (CNA), and Analytical Services, Inc. (ANSER) which are essentially operations and systems research organizations. . . .

As I noted earlier, studies and analyses constitute a very important part of the work of these and other defense contractors. In FY 1967 we spent a total of \$51.0 million for this purpose. In FY 1968

the Congress provided only \$45.2 million. While this approximately 10 percent reduction may seem small in relation to the total, the rise in costs over the period has accentuated its impact. Nevertheless, we have carefully reviewed all studies and analyses proposed for FY 1969, and we have included in our budget request a total of only \$46.4 million, about \$1 million more than the amount appropriated by the Congress last year, but almost \$9 million below the original request for FY 1968. To obtain even tighter management control over this category of activities, we now require that each such study must be approved by the level of command empowered to implement the findings. Moreover, the principal official responsible for research and development in each Service will now periodically review all such studies and analyses both for budget purposes and for implementation.

The Department of Defense Space Program

Inasmuch as the various elements of the Defense Department space effort are included in several program and budget categories, I have followed the practice of assembling all of them in a summary table (which is classified and has been provided to the Committee) and discussing the program as a separate entity. . . .

The largest project in the Defense Department Space Program is the Manned Orbiting Laboratory (MOL), for which \$431 million was provided last year and \$600 million is requested in FY 1969. . . .

As indicated by our budget request, FY 1969 is expected to be a peak year of activity in the MOL program, including the completion of a major portion of the structural test programs on flight hardware, continued fabrication of hardware for the first three flights, developmental test firings of the seven-segment solid motors for the Titan III M, and installation of the ground equipment in the launch complex.

For development work on the Defense Satellite Communications and Tactical Satellite Communications programs (including the procurement of satellites and advanced termi-

nals), we have included a total of \$60.4 million in the FY 1969 Budget (exclusive of work at the Lincoln Lab, \$11.4 million which is funded separately). . . . Development work on this new improved, higher-power, synchronous satellite is scheduled to be initiated in FY 1969. Concurrently, we will continue our programs to upgrade our present satellite communications terminals and initiate development of advanced land, sea and air terminals. . . .

A Tactical Satellite Communications Program (TACSATCOM) UHF satellite was successfully launched in 1967 and placed in an equatorial, near-synchronous orbit, with all systems operating properly. Another UHF satellite capable of multiple access operation (i.e., numerous stations using the satellite simultaneously) will be launched in mid-1968. The development and fabrication of a new, larger experimental tactical communication satellite is now in progress. . . . For the longer-range future, the Services are studying the requirements for an operational system, and desired technical features which are identified by this effort will be included as objectives in the present research and development test program wherever possible.

The next item, for which \$10.5 million is requested in the FY 1969 Budget, comprises the space-related portion of the VELA nuclear test detection program. (Another major part of this program is the Large Aperture Seismic Array which is used to monitor underground nuclear detonations.)

The next item, the Navy's navigation satellite system, for which funds are requested for FY 1969, permits ships to determine their location promptly and precisely by observation of orbiting satellites which continually broadcast their own position. The major portion of the FY 1969 request is for the procurement of new satellites, and for the operating and maintenance costs of the launches and four tracking stations (two of which are used to inject orbital data into the satellite's memory bank for rebroadcast).

Research and development funding for the Anti-Satellite System has been completed, and funds requested for FY 1969 will provide for its normal operating costs.

The funds for space Geodesy will support tri-Service efforts to provide precise information about the earth's size, shape and gravity field.

The early versions of the Titan III space boosters have already entered the operational inventory. The Titan III B (Agena) was put into production over a year ago, and the Titan III C followed last summer, after having demonstrated its reliability and capability over two years of flight testing. These Titan vehicles will be used for many of our high-priority space shots over the next few years. Meanwhile, development work will continue on the previously mentioned Titan III M launch vehicle for the MOL program. Development was also initiated this past year on a new Titan III D configuration to provide greater thrust. Funds are included in the FY 1969 Budget to support all of these Titan III programs.

The funds requested in FY 1969 for Agena D will continue the effort I described last year to increase Agena D for the heavier satellite payloads now projected as well as to improve its payload and orbit adjusting capability. . . .

The "Spacecraft Technology and Advanced Reentry Test" (START) program, which has largely (and very much less expensively) replaced the Dynasoar program cancelled in FY 1965, is developing multi-purpose reusable spacecraft and reentry vehicle technology, and presently comprises three major efforts: Project PILOT; the high performance maneuverable reusable spacecraft; and expandable structure airlocks and encapsulation techniques.

Project PRIME, completed last August, comprised a series of flights of a small maneuverable lifting body, the SV-5. These flights demonstrated the feasibility of returning data capsules from orbit by means of a spacecraft capable of highly accurate maneuver over large lateral ranges and at extremely high altitudes to precise recovery areas where they could be aerially retrieved. . . .

Project PILOT, an extension of the PRIME experiment, is designed to investigate the characteristics of a full-scale maneuverable manned lifting body at slower speeds and lower altitudes, including a detailed exam-

ination of its landing characteristics. The first PILOT flight is scheduled for this summer. The data obtained from PRIME and PILOT, when taken together, will help provide a technological base for the future development of a reusable, maneuverable spacecraft for returning astronauts from space. . . .

The third effort under this program includes the development and test of expandable structures for use as airlocks (in order to permit ingress or egress from a spacecraft without depressurizing the whole vehicle), and the exploration of encapsulation techniques for the return of data to earth from orbit.

"Advanced Space Guidance," for which funds are requested in FY 1969, is a program which seeks to improve our autonomous space navigation capabilities by supporting research and equipment development in such areas as: the reliability and accuracy of inertial guidance systems; horizon sensors; star and landmark trackers; and the on-board determination of astronomical data.

The fund request for "Advanced Liquid Rocket Technology" supports the sole remaining program of this type not only in the Department of Defense, but in the nation. The two projects in this program involve the development of a reusable upper stage cryogenic liquid engine for use in recoverable spacecraft, and a high-performance fully throttleable hydrogen/fluorine engine.

The "Ground Support" category, for which \$249 million is requested in FY 1969, is that portion of the costs of the missile ranges, test instrumentation, and satellite detection and tracking systems which is charged to space activities. The last two categories, "Supporting Research and Development" and "General Support," constitute the overhead of the military space program and consist of prorated portions of the costs of a wide range of space-related activities. About \$1,039 million has been included in the FY 1969 Budget for these purposes.

In total we are requesting about \$2,216 million for the Defense Department's space effort in FY 1969, about \$267 million more than FY 1968 and about \$552 million more than FY 1967. Most of this increase is related to the MOL program.

Other Major Programs

For purposes of presentation, four major programs covering support-type functions have been grouped together in this section.

Intelligence and Communications

This program comprises the centrally directed defense intelligence and security functions, communications, and other special activities conducted by the Services, which are directly related to the missions of the combat forces in the Strategic, General Purpose and Airlift/Sealift programs, but which are more easily managed in homogenous functional groupings of similar or complementary activities than by distribution among the relevant programs.

Intelligence and Security

The FY 1969 Budget includes funds for our on-going intelligence and security programs. Because of their special sensitivity, they are not discussed in this unclassified statement.

National Military Command System

The National Military Command System (NMCS), the primary subsystem of the World-Wide Military Command and Control System, is designed to provide the means for exercising strategic and operational direction of the Armed Forces in time of crisis or under conditions of limited or general war. The NMCS comprises the National Military Command Center (NMCC) at the Pentagon, the Alternate National Military Command Center (ANMCC), the National Emergency Command Post Afloat (NECPA), the National Emergency Airborne Command Post (NEACP), and the communications linking these command facilities with the unified and specified commands and Service headquarters.

With respect to the NMCC, we have expanded its automatic data processing capacity to handle the increased workload related to Southeast Asia operations and to meet other needs. The FY 1969 Budget provides funds for a still further improvement

in data processing capability which will permit the NMCC to maintain, under all conditions, up-to-date information on operations being conducted by the unified and specified commanders, the disposition of friendly forces, and the enemy order of battle.

With respect to the NECPA, we propose to upgrade the automatic data processing and communications equipment on the Northampton to give it capabilities comparable to its sister ship, the Wright. This new equipment should be operational by January 1969. A third tropo-scatter communications station at Lola, N.C., will be completed this year, further extending the operating range of the NECPA ships.

With respect to the NEACP, VLF/LF transmitting systems are being installed in the EC-135J airborne command post aircraft. These communications systems can be used in a nuclear environment for the transmission of emergency orders.

Communications

The communications category includes both the Defense Communications System (DCS) and certain non-DCS communications operated by the Military Departments. The DCS elements include the world-wide, long-haul, owned and leased, point-to-point wire, cable, radio and satellite communications facilities. Its two principal elements are the Automatic Voice Network (AUTOVON) and the Automatic Digital Network (AUTODIN), but it also includes other systems, some of which are discussed here. The non-DCS elements include: the tactical portions of these communications systems which serve the subordinate commanders of unified commands, or which are self-contained within tactical organizations; self-contained local communications facilities such as those serving an individual Army base; land, ship and airborne terminal facilities; and ship-to-ship, air-to-air and ground-air-ground systems. Also included in this category is the COMSEC program which comprises our efforts to protect telecommunications and certain other communications systems.

The AUTOVON System is essentially a direct dial telephone

system served by a number of switching centers. Our present plans call for expanding AUTOVON to 93 switching centers by 1972—19 overseas, 9 in Canada and 65 in the United States—a reduction of one from last year's plan. We are also continuing the expansion of the AUTODIN System, and by the end of FY 1968 we should have 19 switching centers in operation, substantially completing the planned world-wide system of 20 switches. This system will be able to handle more than 40 million punch cards daily, greatly facilitating defense management in such areas as command, supply, inventory, control, personnel, finance and intelligence.

The Phase I portion of the Automatic Secure Voice Communications Network, scheduled to be completed during FY 1969, will provide manual and automatically switched secure voice communications to about 1,850 subscribers, about 450 more than planned a year ago. This system will consist of three prototype VOCOM switches and other automatic and manual switches, including the Talk Quick Southeast Asia system, organized in a single integrated complex.

Last July three operational satellites were added to the space segment of the Initial Defense Satellite Communications System (IDSCS), along with an experimental satellite. One of the three operational satellites failed to function properly, giving us an operating system of 17 satellites and 28 terminals as of December 1967. By end FY 1968, 36 terminals (including 7 aboard ship) should be operational. This initial system provides from one to eleven duplex voice channels, depending on the equipment and operating conditions. This system also provides an emergency capability for transmitting high quality photographs within hours rather than days. It is expected that this emergency capability will be converted to an operational capability in early FY 1969. Improved equipment for both the space and ground terminal portions of the system are being developed in the research and development program.

In addition to the systems already approved for operational deployment, there are a large number of other communications projects in research and development. One such project, Mallard, is a cooperative in-

ternational effort to develop and produce a major tactical (trunking and distribution) communications system for possible use within the field armies of the United States, the United Kingdom, Canada and Australia. Such a system would provide secure, fully automatic, switched communications in the battle area. Other projects include the development of both light-weight and heavy transportable communications packages for possible use in areas where adequate military or commercial communications do not exist.

Other Specialized Activities

The "Intelligence and Communications" program also includes certain mission-related activities, such as weather service, oceanography, and aerospace rescue and recovery.

Weather Service. The Naval and Air Force Weather Services operate a global network of facilities for gathering and analyzing climatological and geophysical data and for disseminating forecasts in support of all DOD components and the National Aeronautics and Space Administration's space program. They also collect nuclear debris air samples for the Atomic Energy Commission in connection with the test ban treaty safeguards, and operate hurricane and typhoon tracking services.

Our capabilities in this area have been significantly enhanced during the past year by the addition of a number of new satellite and surface-based data acquisition systems, including: the National Operational Meteorological Satellite System, which provides cloud cover pictures that can be received directly by military ground and ship-based terminals; the Application Technology Satellite, which provides cloud cover photographs and processed weather and oceanographic charts from a stationary orbit; two new VELA satellites which augment the space and environmental data of the Solar Observing and Forecasting Network (SOFNET) stations as well as performing nuclear test detection functions; and the addition of three new solar telescopes to SOFNET to permit continuous surveillance of the sun, as assessment of the effects of solar flares on satellite and other space operations and of the effect of magnetic storms on communications.

SOFNET also provides data for the Over-the-Horizon radars and for calculating satellite orbits.

Oceanography. This program, together with portions of the general intelligence and research and development programs (e.g., mapping, charting and geodesy, and deep submergence), comprises the Navy's activities in the field of ocean science and technology. The size and scope of our undersea survey, research and technology programs have been increased considerably in recent years.

The Navy, of course, has long conducted oceanographic and charting surveys in support of both operational requirements and research and development programs. The Oceanography program includes the activities of the Navy's Oceanographic Office, the Naval Observatory, Defense support of the National Oceanographic Data Center, and their related research aircraft and survey ships which are engaged in a broad range of missions. For example, ocean-wide surveys provide oceanographic and acoustic data to support ASW and undersea warfare systems in controlling the strategic ocean areas of the world, while marine geophysical surveys provide acoustic propagation loss data for support of new long-range sonars.

At end FY 1968 the Oceanography program will have 10 oceanographic research ships and three environmental prediction research aircraft. The new AGS oceanographic survey ship funded in FY 1967 and originally expected to be commissioned by end FY 1969 has slipped somewhat and will now enter the force in FY 1970, along with the two new small AGORs (oceanographic research ships) funded last year and subsequently transferred from the research and development program. We presently plan to build seven more oceanographic ships over the program period, and by end FY 1973, we should have 13 ships, nine of which will have been commissioned since FY 1966.

The closely related Mapping, Charting and Geodesy program collects hydrographic, magnetic and gravitational data and will include 13 oceanographic survey vessels and two specially equipped aircraft at end FY 1968.

The major research and development effort in this area is the Deep Submergence Program which is designed to improve man's ability to

live, work and conduct salvage and rescue operations beneath the sea. The program includes the "Man-in-the-Sea" project which is concerned with developing the technology to permit "saturated" divers to live and work at depth of 600 feet (and later 1,000 feet) for periods up to a month or more. The SEALAB series of experiments in underwater habitation are a part of this effort, and SEALAB III will be conducted at 450 feet and 600 feet depths in 1968. Another project is concerned with developing self-propelled, highly maneuverable personnel rescue vehicles which will be able to reach disabled submarines in any part of the world. The prototype vehicle is currently under construction, and a total of six are planned. An emergency rescue capability with the first vehicle is expected by early FY 1969. These vehicles will have a 5,000-foot diving capability so they may also ultimately be used for underwater search operations. Also under development is an even deeper diving search vehicle for operation down to a depth of 20,000 feet.

Air Rescue and Recovery. The Air Rescue and Recovery Program comprises the Air Force Aerospace Rescue and Recovery Service (ARRS) and certain specialized forces of the other three Services. Only the Air Force has a specifically designated sea and air rescue service; the other Services assign helicopters and fixed-wing aircraft to this mission on an as-needed basis. . . .

The Air Force ARRS operates and maintains 15 air rescue squadrons consisting of about 130 aircraft, and has about 140 additional aircraft assigned to various bases for local short-range rescue activities. Of the 15 ARRS rescue squadrons, three are presently deployed in Vietnam. These squadrons presently comprise 11 HC-130 fixed-wing aircraft and 32 HH-43, 22 HH-3 and 6 HH-53 helicopters. Past procurements will permit the addition of another four HH-53s to these forces by end FY 1969. To meet project HH-3/HH-53 attrition, funds for the procurement of 14 additional HH-53s have been included in the FY 1969 budget. . . .

The Navy maintains helicopters with a search and rescue mission on all aircraft carriers (including some LPH helicopter carriers) and cruisers, but most of these helicopters have other missions as well. In ad-

dition, the Navy has created a special rescue detachment of 12 helicopters in the Gulf of Tonkin—half deployed aboard destroyers on coastal patrol and half aboard one of the carriers on Yankee Station. The FY 1969 Budget includes funds for 27 UH-1Es for the Navy's search and rescue mission.

For the future we have a number of studies underway aimed at improving our combat aircrew recovery capabilities. These include new designs for rescue aircraft, better methods for night time search and rescue operations, and improved escort and suppressive fire tactics.

Nuclear Weapons. The Defense Atomic Support Agency (DASA) provides: operational, logistic and training support for the Military Services on nuclear weapons; liaison with the Atomic Energy Commission on the development of nuclear weapons; management of the national nuclear weapons stockpiles and the stockpile sites; conduct of nuclear effects tests; and specialized staff assistance to the Secretary of Defense and Joint Chiefs of Staff on these matters. The nuclear weapons effects tests and research, funded as part of the Research and Development Program, are designed to characterize the phenomena associated with nuclear detonations, their effect on military systems, and the means of countering these effects. While some of these effects can be simulated in the laboratory, others require actual underground tests, and the FY 1969 Budget includes funds for both activities. . . .

Training and Medical

This program includes training, medical and other activities associated with personnel, except where such activities are an integral part of another program. . . .

Training

Individual training, from recruit instruction to professional education, is a large and important defense activity. Training costs in FY 1969 will rise only slightly to \$4.4 billion from the \$4.3 billion of FY 1968 now that the period of rapid force buildup is over and manpower levels are expected to stabilize.

Recruit Training. Recruit training

loads in FY 1969 are expected to remain at about current levels. We now estimate that about 883,000 recruits will enter basic training in FY 1969. Of the FY 1969 total, the Army will train about 535,000; the Air Force about 128,000; the Navy about 136,000; and the Marine Corps about 84,000. . . .

Technical Training. Enlisted personnel in the four Services are currently receiving advanced training for some 1,500 occupational specialties. Technical training usually requires an average of two months of classroom instruction, although proficiency in some specialties is acquired on the job and for a few highly technical occupations up to a year may be needed.

Since the beginning of the buildup in July 1965, we have been faced with a sharply increased requirement for junior non-commissioned officers (particularly in the combat branches) and for technical supervisors. To alleviate this problem, the Army has instituted a new accelerated program designed to meet the added requirements for non-commissioned officers and technical supervisors in short tour areas by providing this training in some 70 military occupational specialties. This training will be provided to about 50,000 men in FY 1968-69. . . .

Professional Training. In order to fulfill the growing requirements for officers with advanced education in scientific, engineering, managerial and professional military fields, the Services provide for professional training at the postgraduate level in both military and civilian schools. The military schools include the various Service command and staff colleges, the Service war colleges and the joint Service colleges, where over 3,000 students are enrolled (including foreign military officers and U.S. civilians). For specialized scientific and technical graduate education, the Services as a matter of policy send officers to civilian institutions whenever feasible. At the present time about 2,800 officers are enrolled at these civilian schools. In addition, the Naval Postgraduate School and the Air Force Institute of Technology (accredited, degree-granting military graduate schools) provide Service-oriented graduate education to approximately 1,700 officers.

Pilot Training. Pilots are among

the most highly trained and skilled personnel in the Military Services, and flight training is the most expensive kind of instruction given by the Defense Department. We are now spending over \$1.5 billion annually for pilot training. In addition to the combat aircraft used for advanced flight training, we are using 8,000 training aircraft, representing an investment of about \$6 billion, for undergraduate and other non-combat flight training. . . .

Total Defense Department pilot production has been increased each year, from a low of 3,292 in FY 1962 to a total of 10,586 expected in FY 1968. A total output of 13,317 pilots has been provided in the FY 1969 budget.

Service Academies. We are continuing our program to increase the output of the Military Academy. In FY 1969 we expect enrollment will average about 3,800 cadets, and by 1971 we should be able to reach our goal of 4,400. To accommodate this larger enrollment, we will continue the expansion of facilities with the construction in FY 1969 of new barracks for 1,364 cadets.

At the Naval Academy enrollment in FY 1969 will remain at about 4,100 midshipmen, roughly the same level as in the past few years. Construction funds are requested in FY 1969 to prepare suitable sites for future library and engineering buildings, a laboratory complex and a new auditorium.

The Air Force Academy is also building its enrollment toward an ultimate goal of 4,400. In FY 1969 we anticipate an average enrollment of about 3,400 cadets. No new major construction will be undertaken at the Air Force Academy in FY 1969.

Medical Services

Medical Services include those costs for medical and dental care not directly related to military units in the other major programs, the costs of providing medical care for authorized personnel in non-military facilities, veterinary services, and the operation of various health service activities such as the medical centers, preventive medical units and the Armed Forces Institute of Pathology. The annual operating costs of these facilities and services now exceed one billion dollars a year. . . .

* * * * *

Table No. 1

Department of Defense
BUDGET SUMMARY—FY 1969
(Millions of Dollars)

	FY 1967	FY 1968	FY 1969
Total Obligational Authority (TOA):			
Military Personnel	20,067	22,199	23,037
Operation & Maintenance	19,361	20,548	22,839
Subtotal—Operations	39,428	42,747	45,876
Procurement	24,110	22,378	25,816
Research, Development, Test & Evaluation	7,289	7,415	8,031
Military Construction	1,160	1,505	1,440
Family Housing	439	604	538
Civil Defense	101	86	77
Special Foreign Currency Program	4	—	16
Subtotal—Military Functions	72,532	74,735*	81,794
Military Assistance	904	484	620
Total—TOA	73,436	75,219*	82,414
Financing Adjustments	—712	—1,907	—2,617
Receipts and Funds Transactions	268	43	—221
New Obligational Authority (NOA)	72,992	73,355*	79,576
Expenditures	68,331	74,219*	77,113

* Of these amounts, \$796 million of TOA/NOA and \$782 million of expenditures are for the pay increases enacted in the fall of FY 1967. Provision for these pay increases was included in the Contingency item in the FY 1968 President's Budget, rather than in the Department of Defense section.

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Table No. 2

Department of Defense
REVISION OF FY 1968 BUDGET
(Millions of Dollars)

	Amount submitted to Congress Jan 1967	Amount enacted	Revision January 1968		Pay and postal increase suppl.	Other adjustments	Revised Amount
			Increases	Decreases			
Total Obligation Authority (TOA):							
Military Personnel	22,001	21,782	230	412	600	—	22,199
Operation & Maintenance	19,136	18,856	1,918	386	164	—4	20,548
Subtotal—Operations	41,137	40,638	2,148	799	764	—4	42,747
Procurement	24,013	23,237	3,787	4,652	7	—	22,378
Research, Dev., Test & Eval.	7,523	7,468	622	702	26	—	7,415
Military Construction	2,144	1,517	—	—	3	—15	1,505
Family Housing	823	700	—	—	*	—96	604
Civil Defense	111	86	—	—	—	—	86
Special Foreign Currency Program	16	11	—	11	—	—	—
Total—Military Functions	75,766	73,657	6,557	6,164	800	—116	74,735
Military Assistance	621	425	—	—	—	59	484
Total—TOA	76,387	74,082	6,557	6,164	800	—57	75,219
Financing Adjustments	—1,159	—1,566	—504	111	—	52	—1,907
Receipts and funds transactions	—	—	—	—	—	43	43
New Obligational Authority (NOA)	75,228	72,516	* 6,053	* 6,053	800	38	73,355

* Less than 500,000.

* Includes \$1,695,600,000 proposed transfers among the military personnel, operation and maintenance procurement and research, development, test and evaluation (RDT&E) appropriations as contained in the Budget revision shown in the President's FY 1969 Budget.

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Table No. 3

Department of Defense

FINANCIAL SUMMARY BY PROGRAM AND MILITARY DEPARTMENT

(Billions of Dollars)

	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965	FY 1966	FY 1967	FY 1968	FY 1969
Strategic Forces		11.3	10.4	9.3	7.1	6.7	6.9	7.9	9.6
General Purposes Forces		17.9	17.9	17.9	19.1	29.5	32.7	32.6	35.2
Intelligence and Communications		3.2	3.9	4.3	4.5	5.0	5.3	5.7	6.3
Airlift and Sealift		1.0	1.1	1.1	1.1	1.6	1.9	1.9	1.8
Guard and Reserve Forces		1.8	1.7	1.9	2.0	2.3	2.7	2.7	3.0
Research and Development		4.3	5.0	5.0	4.7	4.8	4.8	4.6	5.1
Central Supply and Maintenance		3.8	3.9	4.1	4.2	5.6	7.1	7.1	7.3
Training, Medical, etc.		4.9	5.1	5.5	5.9	7.5	8.5	9.4	9.8
Administration and Associated Activities		1.1	1.1	1.2	1.2	1.8	1.5	1.6	1.7
Military Assistance		1.9	1.7	1.3	1.3	1.9	2.5	2.1	2.7
Unfunded (-) Current Service Retirement Pay		-0.8	-0.7	-0.7	-0.5	-0.5	-0.4	-0.3	-0.1
Total Obligational Authority (TOA)	46.0	50.4	51.2	51.0	50.9	66.2	73.4	75.2	82.4
Financing Adjustments	-2.9	-1.0	-0.1	-0.1	-0.4	-2.6	-0.4	-1.9	-2.8
New Obligational Authority (NOA)*	43.1	49.4	51.1	50.9	50.5	63.5	73.0	73.4	79.6
Expenditures*	44.7	48.2	50.0	51.2	47.4	55.4	68.3	74.2	77.1
Expenditures as Percentage of GNP	8.8	8.9	8.7	8.4	7.3	7.8	9.0	9.2	8.9
Department of Army	10.4	12.7	12.0	12.5	12.3	18.6	22.5	24.2	26.1
Department of Navy	12.7	14.6	14.7	14.4	14.8	19.4	21.5	21.1	24.0
Department of Air Force	19.9	19.6	20.4	20.0	19.4	23.5	24.7	25.1	27.0
Defense Agencies	1.1	1.2	2.0	2.3	2.5	2.9	3.3	3.8	4.2
Defense Family Housing	0.4	0.5	0.6	0.6	0.6	0.6	0.4	0.6	0.5
Military Assistance	1.5	1.8	1.6	1.2	1.2	1.2	0.9	0.5	0.6
Total Obligational Authority	46.0	50.4	51.2	51.0	50.9	66.2	73.4	75.2	82.4
Military Personnel	12.1	13.1	13.1	14.2	14.8	17.0	20.1	22.2	23.0
Operation and Maintenance	10.3	11.4	11.5	11.7	12.5	15.4	19.4	20.5	22.8
Procurement	14.2	16.2	16.1	15.1	14.2	22.4	24.1	22.4	25.8
Research, Development, Test and Evaluation	6.4	6.3	7.0	7.1	6.5	6.9	7.3	7.4	8.0
Military Construction	1.0	0.9	1.3	1.0	1.0	2.5	1.2	1.5	1.4
Defense Family Housing	0.4	0.5	0.6	0.6	0.6	0.6	0.4	0.6	0.5
Military Assistance	1.5	1.8	1.6	1.2	1.2	1.2	0.9	0.5	0.6
Other		0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Obligational Authority	46.0	50.4	51.2	51.0	50.9	66.2	73.4	75.2	82.4

Notes:

- (1) FY 1968 TOA and NOA amounts include proposed supplemental appropriations to finance recently enacted legislation: \$600 million for military pay increase; \$196 million for civilian pay increase and \$4 million for postal rate increase. Also included are adjustments for inter-appropriation transfers of \$1,695,600,000 as contained in the budget revision shown in the President's FY 1969 Budget.
- (2) FY 1969 TOA and NOA amounts include \$75 million for proposed legislation.

Adjustment for trust fund and receipts transactions.

OASD (Comptroller)
January 29, 1968

Table No. 4

Department of Defense

DIRECT BUDGET PLAN (TOA), NEW OBLIGATIONAL AUTHORITY (NOA), AND EXPENDITURES

Fiscal Years 1967-1969

(Millions of Dollars)

	Direct Budget Plan (TOA)			New Obligational Authority (NOA)			Expenditures		
	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969
<i>Functional Classification</i>									
Military Personnel									
Active Forces	17,318	19,192	19,786	17,426	19,192	19,786	17,054	18,850	19,600
Reserve Forces	918	935	953	951	935	953	902	890	905
Retired Forces	1,831	2,072	2,275	1,839	2,072	2,275	1,830	2,060	2,265
Proposed Legislation	—	—	23	—	—	23	—	—	23
Total—Military Personnel	20,067	22,199	23,037	20,216	22,199	23,037	19,787	21,800	22,793
Operation and Maintenance									
Basic	19,361	20,548	22,787	19,434	20,548	22,787	19,000	19,800	22,213
Proposed Legislation	—	—	52	—	—	52	—	—	47
Total—Operation & Maintenance	19,361	20,548	22,839	19,434	20,548	22,839	19,000	19,800	22,260
Subtotal—Operations	39,428	42,747	45,876	39,650	42,747	45,876	38,787	41,600	45,053
Procurement	24,110	22,378	25,816	22,871	20,716	23,254	19,012	21,470	23,445
Research, Dev., Test, and Eval.	7,289	7,415	8,031	7,172	7,148	8,006	7,160	7,200	7,800
Military Construction	1,160	1,505	1,440	1,098	1,405	1,430	1,536	1,565	1,450
Family Housing	439	604	538	507	691	602	482	520	570
Civil Defense	101	86	77	101	86	77	100	93	89
Special Foreign Currency Program	4	—	16	7	—	13	—	2	6
Working Capital Accounts	—	—	—	535	118	—	512	1,400	-1,614
Military Assistance	904	484	620	782	400	540	873	550	525
Receipts and Funds Transactions	—	—	—	268	43	-221	-129	-181	-211
Total—Department of Defense	73,436	75,219	82,414	72,992	73,355	79,576	68,331	74,219	77,113
<i>Department or Agency</i>									
Department of the Army	22,438	24,129	25,974	22,876	23,502	25,150	20,961	23,988	24,869
Department of the Navy	21,522	21,110	23,928	20,669	20,212	22,981	19,246	20,801	22,014
Department of the Air Force	24,708	25,052	26,969	24,195	24,410	26,003	22,918	24,582	25,447
Defense Agencies/OSD	3,763	4,358	4,770	3,970	4,545	4,830	4,241	4,230	4,169
Civil Defense	101	86	77	101	86	77	100	93	89
Proposed Legislation	—	—	75	—	—	75	—	—	70
Total—Military Functions	72,532	74,735	81,794	71,809	72,755	79,116	67,466	73,694	76,658
Military Assistance *	904	484	620	1,183	600	460	865	525	455
Total—Department of Defense	73,436	75,219	82,414	72,992	73,355	79,576	68,331	74,219	77,113

Notes:

(1) FY 1968 TOA and NOA amounts include proposed supplemental appropriations to finance recently enacted legislation: \$600 million for military pay increase; \$196 million for civilian pay increase; and \$4 million for postal rate increase. Also included are adjustments for inter-appropriation transfers of \$1,695,600,000 as contained in the budget revision shown in the President's FY 1969 Budget.

(2) FY 1969 TOA and NOA amounts include \$75 million proposed legislation.

* Amounts include the applicable portion of "Receipts and Funds Transactions" itemized separately in the functional classification section above.

Table No. 5

Department of Defense

DIRECT BUDGET PLAN (TOA), NEW OBLIGATIONAL AUTHORITY (NOA), AND EXPENDITURES

Fiscal Years 1967-1969 by Functional Classification and Department or Agency

(Millions of Dollars)

	Dept. of Defense—Total			Dept. of the Army			Dept. of the Navy			Dept. of the Air Force			Def. Agencies/ OSD/Civil Def.		
	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969	FY 1967	FY 1968	FY 1969
Total Obligational Authority (TOA):															
Military Personnel	17,318	19,192	19,809												
Active Forces	918	935	953												
Reserve Forces	1,831	2,072	2,275												
Retired Pay	20,067	22,199	23,037												
Total—Military Personnel	19,361	20,548	22,839												
Operation and Maintenance	39,428	42,747	45,876												
Subtotal—Operations	10,315	8,972	8,995												
Procurement	2,039	2,478	3,642												
Aircraft	2,176	1,341	1,812												
Ships	528	326	310												
Tracked Combat Vehicles	5,271	6,079	7,112												
Ordnance, Vehicles & Rel. Equip.	1,517	1,366	1,676												
Electronics & Communications	2,265	1,816	2,268												
Other Procurement	24,110	22,378	25,316												
Total—Procurement	618	563	659												
Research, Dev., Test, & Eval. (RDTE&E)	1,199	1,024	1,037												
Military Sciences	2,456	2,543	2,543												
Aircraft	961	1,064	1,299												
Missiles	288	317	418												
Military Astronautics	357	331	340												
Ships and Small Craft	985	956	1,109												
Ordnance, Vehicles & Rel. Equip.															
Other Equipment															
Programwide Management & Support	425	437	512												
Emergency Fund		24	125												
Total—RDTE&E	7,289	7,415	8,031												
Military Construction	1,160	1,505	1,440												
Other	544	690	631												
Subtotal—Military Functions	72,532	74,735	81,794												
Military Assistance	904	484	620												
Total—TOA	73,436	75,219	82,414												
Plus NOA for Working Capital															
Accts	535	118													
Other financing adjustments	1,247	2,025	2,617												
Receipts and Funds Transactions	268	43	221												
New Obligational Authority	72,992	73,355	79,576												
Expenditures	68,331	74,219	77,113												

Notes:

- (1) FY 1968 TOA and NOA amounts include proposed supplemental appropriations to finance recently enacted legislation: \$600 million for military pay increase; \$196 million for civilian pay increase; and \$4 million for postal rate increase. Also included are adjustments for inter-appropriation transfers of \$1,695,600,000 as contained in the budget revision shown in the President's FY 1969 Budget.
- (2) FY 1969 TOA and NOA amounts include \$75 million for proposed legislation not distributed by Department or Agency.

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January 29, 1968

Table No. 6

Department of Defense

ESTIMATED OBLIGATIONS AND AMOUNTS AVAILABLE FOR OBLIGATION

Fiscal Years 1967-1969

(Millions of Dollars)

Item	New obliga- tional authority	Reimburse- ments	Total available for obligation	Obliga- tions	Unobligated balance carried forward	Unobligated carryover as % of available
<i>Fiscal Year 1967—Actual</i>						
Department of the Army	22,876	3,183	28,028	24,947	2,965	10.6
Department of the Navy	20,669	1,462	28,783	21,961	6,762	23.5
Department of the Air Force	24,193	1,447	30,161	26,531	3,614	12.0
Defense Agencies/OSD	3,970	73	4,315	3,845	362	8.4
Civil Defense	101	—	141	118	22	15.6
Subtotal—Military Functions	71,809	6,165	91,428	77,402	13,725	15.0
Military Assistance	1,183	8	741	729	12	1.6
Total	72,992	6,174	92,169	78,132	13,737	14.9
<i>Fiscal Year 1968—Estimated</i>						
Department of the Army	23,502	3,175	29,759	27,137	2,622	8.8
Department of the Navy	20,212	1,405	28,450	23,286	5,164	18.2
Department of the Air Force	24,410	1,306	29,419	26,352	3,066	10.4
Defense Agencies/OSD	4,545	73	4,855	4,338	438	9.0
Civil Defense	86	—	109	106	3	2.8
Subtotal—Military Functions	72,755	5,959	92,592	81,219	11,294	12.2
Military Assistance	600	8	400	390	10	2.5
Total	73,355	5,967	92,992	81,608	11,304	12.2
<i>Fiscal Year 1969—Estimated</i>						
Department of the Army	25,150	3,269	31,555	28,848	2,707	8.6
Department of the Navy	22,981	1,484	30,071	25,851	4,720	15.7
Department of the Air Force	26,003	1,014	30,718	27,436	3,282	10.7
Defense Agencies/OSD	4,830	83	5,351	4,882	387	7.2
Civil Defense	77	—	80	80	—	—
Proposed legislation	75	—	75	75	—	—
Subtotal—Military Functions	79,116	5,799	97,850	86,672	11,095	
Military Assistance	460	8	558	548	10	
Total	79,576	5,807	98,408	87,220	11,105	

Notes:

- (1) The total available for obligation is the sum of (a) unobligated balances brought forward, (b) new obligational authority, (c) unobligated balances transferred, and (d) reimbursements, for general fund accounts.
- (2) The unobligated balance carried forward is the total available for obligation less (a) obligations and (b) amounts withdrawn.

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January 29, 1968

Table No. 7

Department of Defense

ESTIMATED EXPENDITURES AND AMOUNTS AVAILABLE FOR EXPENDITURE

Fiscal Years 1967-1969

(Millions of Dollars)

Item	New obliga- tional authority	Total available for expend- iture	Expend- itures	Unexpended balance carried forward	Unexpended carryover as per- cent of available
<i>Fiscal Year 1967—Actual</i>					
Department of the Army	22,876	31,920	20,961	10,826	33.9
Department of the Navy	20,669	38,826	19,246	19,507	50.2
Department of the Air Force	24,193	36,541	22,918	13,607	37.2
Defense Agencies/OSD	3,970	5,536	4,241	1,180	21.3
Civil Defense	101	220	100	115	52.3
Military Assistance	1,183	5,742	865	5,878	85.0
Total	72,992	118,785	68,331	50,111	42.2
<i>Fiscal Year 1968—Estimated</i>					
Department of the Army	23,502	34,529	23,988	10,572	30.6
Department of the Navy	20,212	39,779	20,801	18,976	47.7
Department of the Air Force	24,410	38,023	24,582	13,443	35.4
Defense Agencies/OSD	4,545	5,720	4,230	1,410	24.7
Civil Defense	86	201	93	108	53.7
Military Assistance	600	4,815	525	4,290	89.1
Total	73,355	123,066	74,219	48,798	39.7
<i>Fiscal Year 1969—Estimated</i>					
Department of the Army	25,150	35,872	24,869	11,003	30.7
Department of the Navy	22,981	42,032	22,014	20,018	47.6
Department of the Air Force	26,003	39,520	25,447	14,074	35.6
Defense Agencies/OSD	4,830	5,940	4,169	1,688	28.4
Civil Defense	77	185	89	96	51.9
Proposed legislation	75	75	70	5	6.7
Military Assistance	460	4,750	455	4,295	90.4
Total	79,576	128,374	77,113	51,179	39.9

Notes:

- (1) The total available for expenditure is the sum of (a) unexpected balances brought forward (b) new obligational authority and (c) transfers between appropriations.
- (2) The unexpected balance carried forward is the total available for expenditure less (a) expenditures and (b) writeoffs/restorations.

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Table No. 8

Department of Defense
ORDER OF MAGNITUDE DATA ON COMPARATIVE EXPENDITURES BY FUNCTIONAL TITLE
Selected Fiscal Years 1955-1969
(Millions of Dollars)

	FY 1955	FY 1957	FY 1959	FY 1961	FY 1963	FY 1965	FY 1966	FY 1967	FY 1968	FY 1969
Functional classification										
Military Personnel	10,643	10,384	10,545	10,651	11,386	12,662	14,407	17,054	18,850	19,623
Active Forces	341	514	615	648	599	725	755	902	890	905
Reserve Forces	419	511	641	786	1,015	1,384	1,591	1,830	2,060	2,265
Retired Pay										
Total	11,403	11,409	11,801	12,085	13,000	14,771	16,753	19,787	21,800	22,793
Operation and Maintenance	7,931	9,487	10,373	10,611	11,874	12,349	14,710	19,000	19,800	22,260
Subtotal—Operations	19,334	20,896	22,179	22,696	24,874	27,120	31,463	38,787	41,600	45,053
Procurement										
Aircraft	8,804	8,647	7,730	5,898	6,309	5,200	6,635	8,411	9,368	8,935
Missiles	604	1,855	3,337	2,972	3,817	2,096	2,069	1,930	2,124	2,670
Ships	944	842	1,491	1,801	2,522	1,713	1,479	1,398	1,170	1,651
Tracked Combat Vehicles						236	202	274	494	380
Ordnance, Vehicles and Related Equipment	1,191	674	399	675	1,665	1,073	1,697	3,978	5,045	6,380
Electronics and Communications	441	704	720	1,042	1,427	897	983	1,284	1,380	1,392
Other Procurement	854	767	730	706	891	625	1,273	1,737	1,888	2,036
Total	12,838	13,488	14,409	13,095	16,632	11,839	14,339	19,012	21,470	23,445
Research, Development, Test and Evaluation	2,261	2,406	2,866	6,131	6,376	6,236	6,239	7,160	7,200	7,800
Military Construction	1,715	1,968	1,948	1,605	1,144	1,007	1,334	1,536	1,565	1,450
Family Housing					427	619	647	482	520	570
Civil Defense		-1	*	*	203	93	86	100	93	89
Special Foreign Currency Program									2	6
Working Capital Accounts	-611	-323	-179	-300	-1,401	-741	281	512	1,400	-1,614
Military Assistance	2,292	2,352	2,340	1,449	1,721	1,229	968	873	550	525
Receipts and Funds Transactions								-130	-180	-211
Total—Department of Defense	37,823	40,788	43,563	44,676	49,973	47,401	55,377	68,331	74,219	77,113
Department or Agency										
Department of the Army	8,901	9,063	9,467	10,130	11,499	11,600	14,832	20,961	23,988	24,869
Department of the Navy	9,732	10,397	11,720	12,214	14,005	13,399	16,026	19,246	20,801	22,014
Department of the Air Force	16,405	18,361	19,083	19,785	20,642	18,216	20,131	22,918	24,582	25,447
Defense Agencies/OSD	494	615	953	1,098	1,905	2,865	3,335	4,241	4,230	4,169
Civil Defense		-1	*	*	203	93	86	100	93	89
Military Assistance	2,292	2,352	2,340	1,449	1,721	1,229	968	865	525	455
Total—Department of Defense	37,823	40,788	43,563	44,676	49,973	47,401	55,377	68,331	74,219	77,113

* Less than \$500,000.

a Amount included in entry for "Ordnance, Vehicles, and Related Equipment."

b Data for receipts and funds transactions (applied to expenditures in the FY 1969 Budget presentation) have not yet been compiled and reflected in totals for FY 1966 and prior years.

c Amounts shown for FY 1967-1969 include the applicable portion of "Receipts and Funds Transactions" itemized separately in the functional classification section above.

d Includes \$70 million for proposed legislation not distributed by the Department or Agency.

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Table No. 9

Department of Defense

ORDER OF MAGNITUDE DATA ON COMPARATIVE NEW OBLIGATIONAL AUTHORITY BY FUNCTIONAL TITLE
Selected Fiscal Years 1955-1969

(Millions of Dollars)

	FY 1955	FY 1957	FY 1959	FY 1961	FY 1963	FY 1965	FY 1966	FY 1967	FY 1968	FY 1969
<i>Functional Classification</i>										
Military Personnel										
Active Forces	10,650	10,411	10,709	10,695	11,431	12,699	14,655	17,426	19,192	19,809
Reserve Forces	369	613	644	660	672	751	818	951	935	953
Retired Pay	424	515	640	790	1,026	1,399	1,600	1,839	2,072	2,275
Total	11,442	11,539	11,993	12,144	13,129	14,849	17,073	20,216	22,199	23,037
Operation and Maintenance	8,276	9,734	10,187	10,702	11,496	12,603	15,339	19,434	20,548	22,839
Subtotal—Operations	19,718	21,273	22,180	22,846	24,625	27,452	32,412	39,650	42,747	45,876
Procurement										
Aircraft	4,922	6,559	6,167	4,998	5,882	5,962	9,354	9,579	8,533	8,730
Missiles	234	2,135	3,966	2,078	3,969	2,615	1,642	2,207	2,634	3,617
Ships	1,150	1,335	1,943	2,246	2,939	1,905	1,522	1,757	1,066	1,712
Tracked Combat Vehicles	^a	^a	^a	^a	^a	211	435	517	553	310
Ordnance, Vehicles and Related Equipment	527	247	545	1,034	1,959	1,431	4,252	5,302	5,296	6,636
Electronics and Communications	327	469	982	935	1,176	1,039	1,240	1,385	1,195	1,575
Other Procurement	260	549	701	425	742	672	1,568	2,125	1,637	2,174
Total	7,420	11,294	14,304	11,716	16,667	13,836	20,013	22,871	20,716	24,754
Research, Development, Test and Evaluation										
Military Construction	1,708	2,185	3,777	6,032	6,993	6,483	6,746	7,172	7,148	8,006
Family Housing	882	1,915	1,385	1,061	1,204	1,049	2,566	1,098	1,405	1,430
Civil Defense	—	—	—	—	126	105	666	507	691	602
Special Foreign Currency Program	—	—	—	—	—	—	107	102	86	77
Working Capital Accounts	1,119	75	57	30	—	—	—	7	—	13
Transfers from prior year balances ^b	—	—	—	—	—	—	—	—	—	—
Military Assistance	—	—	—	—	—	—	—	—	—	—
Receipts and Funds Transactions	—	—	—	—	—	—	—	—	—	—
Total—Department of Defense	31,991	38,273	42,683	43,106	51,119	50,493	63,533	72,992	73,355	79,576
<i>Department or Agency</i>										
Department of the Army	7,764	7,762	9,381	9,914	11,631	12,003	17,492	22,876	23,502	25,150
Department of the Navy	10,221	10,220	11,820	12,431	15,286	14,845	18,486	20,669	20,212	22,981
Department of the Air Force	12,137	17,697	18,713	17,884	20,179	19,219	22,655	24,193	24,410	26,003
Defense Agencies/OSD	666	666	1,255	1,092	2,572	3,192	3,770	3,970	4,545	4,830
Civil Defense	—	—	—	—	126	105	107	101	86	77
Military Assistance ^c	1,204	2,018	1,515	1,785	1,135	1,130	1,023	1,183	600	460
Total—Department of Defense	31,991	38,273	42,683	43,106	51,119	50,493	63,533	72,992	73,355	79,576

^a Amount included in entry for "Ordnance, Vehicles, and Related Equipment."^b Amounts by functional classification above include transfers from prior year balances to reflect total new obligational availability, with this one line deduction to net to NOA.^c Data for receipts and funds transactions (netted against NOA in the FY 1969 Budget presentation) have not yet been compiled and reflected in totals for FY 1966 and prior years.^d Amounts shown for FY 1967-1969 include the applicable portion of "Receipts and Funds Transactions" itemized separately in the functional classification section above.^e Includes \$75 million for proposed legislation not distributed by Department of Agency.

Table No. 10

Department of Defense

MAJOR PROCUREMENT ITEM QUANTITIES—FY 1968
and 1969 PROGRAMS

	FY 1968 Revised Program	FY 1969 Program
Aircraft		
Army	1,168	1,304
Navy and Marine Corps	521	720
Air Force	1,078	919
Total—Aircraft		
Helicopters	1,305	1,626
Other Aircraft	1,462	1,317
Total—All Services	2,767	2,943
Missiles		
Army	14,900	29,807
Navy and Marine Corps	8,972	6,656
Air Force	4,093	6,523
Total—Missiles	27,965	42,986
Ships—Navy		
New Construction	30	25
Conversions	19	43
Total—Ships	49	68
Tracked Combat Vehicles		
Army	3,584	3,156

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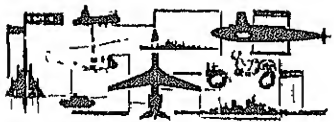
Table No. 11

Department of Defense

MILITARY AND CIVILIAN PERSONNEL—Yearend Number

	FY 1966 actual	FY 1967 actual	FY 1968 estimate	FY 1969 estimate
<i>Military Personnel</i>				
Army				
Officers	117,648	143,425	164,136	171,171
Enlisted	1,079,687	1,296,619	1,368,394	1,333,873
Military Academy cadets	2,316	2,378	3,096	3,350
Total—Army	1,199,651	1,442,422	1,535,626	1,508,394
Navy				
Officers	79,580	81,677	85,597	90,730
Enlisted	660,518	665,226	678,360	699,577
Naval Academy midshipmen	4,331	4,399	4,243	4,243
Aviation cadets	551	92	—	—
Total—Navy	744,980	751,394	768,200	794,550
Marine Corps				
Officers	20,512	23,592	25,236	26,187
Enlisted	240,911	261,584	276,686	280,248
Aviation cadets	293	93	—	—
Total—Marine Corps	261,716	285,269	301,922	306,435
Air Force				
Officers	130,724	135,417	137,128	133,977
Enlisted	753,477	758,648	743,425	730,290
Air Force Academy cadets	3,152	3,361	3,575	3,874
Total—Air Force	887,353	897,426	884,128	868,141
Department of Defense—Total				
Officers	348,464	384,111	412,097	422,065
Enlisted	2,734,593	2,982,077	3,066,865	3,043,988
Academy cadets and midshipmen	9,799	10,138	10,914	11,467
Aviation cadets	844	185	—	—
Total—Defense	3,093,700	3,376,511	3,489,876	3,477,520
<i>Civilian Personnel</i>				
Army	371,121	436,830	439,681	443,654
Navy	356,744	402,513	417,714	413,202
Air Force	306,911	323,316	316,856	318,906
Defense Agencies/OSD	68,923	75,342	73,855	75,368
Total—Defense	1,103,699	1,238,001	1,248,106	1,251,130

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DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of January 1968:

DEFENSE SUPPLY AGENCY

- 9-Burlington Industries, New York, N.Y. \$1,917,750. 4,500,000 linear yards of wind resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1236.
- J. P. Stevens & Co., New York, N.Y. \$2,061,653. 2,500,000 linear yards of wind resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1231.
- C.M. London Co., New York, N.Y. \$1,844,730. 1,786,317 linear yards of wind resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa.
- Damasco Hosiery Mills, Damascus, Va. \$1,606,460. 2,500,000 pairs of men's socks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1224.
- 4-Consolidating, Inc., Philadelphia, Pa. \$1,308,000. 7,500,000 canvas sandbags. Defense General Supply Center, Philadelphia, Pa. DSA 100 68 C 3100 P002.
- 8-Cheubino Pett & Co., Atlantic City, N.J. \$1,446,500. 75,000 men's tropical wool polyester coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1205.
- Marie Dale, Inc., Atlantic City, N.J. \$1,785,073. 100,000 men's tropical wool polyester coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1205.
- DeRosier & Son Co., Vineland, N.J. \$1,153,917. 68,110 men's tropical wool polyester coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1204.
- 11-GenTex Corp., Carolanville, Pa. \$1,086,840. 15,116 crash-type flying helmets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1304.
- 15-Olds Elevator Co., Cleveland, Ohio. \$1,559,628. Fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400-68 C 3692.
- 16-Prentex, Inc., New York, N.Y. \$7,011,520. 5,410,000 linear yards of wind resistant cotton poplin cloth (rip stop type) and 600,000 linear yards of wind-resistant cotton poplin cloth (combed). Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1358.
- Standard Oil Co. of Calif., San Francisco, Calif. \$3,170,815. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 400 68 C 1177.
- 17-Cavalier Bag Co., Lumberton, N.C. \$2,924,450. 10,000,000 canvas sandbags. Defense General Supply Center, Richmond, Va. DSA 400 68 C 3108 P002.
- Dawling Bag Co., Valdosta, Ga. \$2,050,000. 12,000,000 canvas sandbags. Defense General Supply Center, Richmond, Va. DSA 400 68 C 3171 P001.
- 18-Saddler Textiles, New York, N.Y. \$2,043,611. 1,340,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA-100 68 C 1370.
- Putnam Mills, New York, N.Y. \$1,514,250. 1,500,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100 68 C 1378.
- Franklin Clothes, Woodbine, N.J. \$1,182,601. 60,000 men's polyester tropical wool

- coats. Defense Personnel Support Center, Philadelphia, Pa. DSA-100-68-C-1375.
- ReRossi & Sons, Vineland, N.J. \$1,166,447. 58,410 men's polyester tropical wool coats. Defense Personnel Support Center, Philadelphia, Pa. DSA-100-68-C-1294.
- M-R-S Mfg. Co., Flora, Miss. \$1,921,998. Thirty wheeled construction tractors with scrapers. Defense Construction Supply Center, Columbus, Ohio. DSA-700-68-C-8660.
- Sparling Mills, Greenville, R.I. \$3,567,400. 20,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA-400-67-C-7094-P007.
- 22-Baker York, Inc., West Memphis, Ark. \$1,163,987. 166 fork lift trucks with repair parts. Defense General Supply Center, Richmond, Va. DSA-400-68-C-3880.
- Tannenbaum Textile Co., New York, N.Y. \$2,054,250. 2,000,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA-100-68-C-1305.
- 23-U.S. Steel International, Washington, D.C. \$2,551,717. 43,270,711 lbs of structural steel shapes. Defense Industrial Supply Center, Philadelphia, Pa. DSA-500-68-C-8612.
- 24-Van Brode Milling Co., Clinton, Mass. \$4,841,954. 150,810 cases of ration supplement sundries pack. Defense Personnel Support Center, Philadelphia, Pa. DSA-131 8-C 175A1.
- Union Oil Co. of Calif., Los Angeles, Calif. \$1,122,750. 225,000 barrels of diesel fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA-600-68-D-0823-P001.
- 25-H.G. Colton Co., New York, N.Y. \$3,060,625. 3,160,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA-100-68-C-1420.
- 31-J. P. Stevens & Co., New York, N.Y. \$4,610,001. 3,906,000 yards of wind-resistant cotton and nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA-100 68-C-1473.
- Glenn Mfg. Co., Amory, Miss. \$1,140,022. 500,010 pairs of men's wind-resistant cotton trousers (rip stop). Defense Personnel Support Center, Philadelphia, Pa. DSA-100 68 C 1467.
- Winfield Mfg. Co., Winfield, Ala. \$1,085,021. 500,010 pairs of men's wind-resistant cotton trousers (rip stop). Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68 C-1466.



DEPARTMENT OF THE ARMY

- 2-Garrett Corp., Belmar, N.J. \$5,635,500. 255 inflatable shelters for medical units. Farmingdale, N.Y. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-4237.
- Chamberlain Mfg. Co., New Bedford, Mass. \$5,462,500. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0286.
- Continental Motors, Mobile, Ala. \$1,730,661. Engine assemblies for M60 tanks. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-1160.
- General Motors, Detroit, Mich. \$1,300,000. Joint design team effort and support for the main battle tank. Cleveland, Ohio, and Warren, Mich. Tank Automotive Command, Warren, Mich. DA-20-113-AMC-03843-(T).
- General Electric, Syracuse, N.Y. \$4,642,405. Radar sets. Electronics Command, Philadelphia, Pa. DA-AB06-67-C-2341.
- 3-General Motors, Detroit, Mich. \$1,000,000. Engineering design test for the main battle tank. Milwaukee, Wis. and Cleve-

- land, Ohio. Tank Automotive Command, Warren, Mich. DA-20 113-AMC-8843-(T).
- Bell Aerospace Corp., Fort Worth, Tex. \$1,199,082. Nonpersonal services and supplies for a product improvement program for the UH-1 and AH-1 series helicopters. Hurst, Tex. DA-AJ01-68-C-1308; \$2,260,040. Repair of UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-D-0058.
- Kemmons-Wilson, Inc., and South and Patton, Memphis, Tenn. \$9,031,122. Construction of 360 family housing units, with all supporting utilities, in the Canal Zone Engineer Dist., Jacksonville, Fla. DA-CA17-68-C-0027.
- 4-Raytheon Co., Norwood, Mass. \$2,156,584. Multiplexers and spare parts kits. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0600.
- Texas Instruments, Attleboro, Mass. \$1,026,791. Bullet jacket cups for 7.62mm tracers. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0350.
- Emerson Electric, St. Louis, Mo. \$10,193,000. Aircraft armament sub-systems, test sets and test stands for XM28 and TAT102A sub-systems. Army Weapons Command, Rock Island, Ill. DA-AF03-68-C-0025.
- 5-Zero Mfg. Co., Los Angeles, Calif. \$4,598,620. Expandable shelters. Burbank, Calif. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-4236.
- General Motors, Indianapolis, Ind. \$2,589,674. T-63-A-5A engines for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1333.
- Chaney & James Construction Co., Richardson, Tex. \$2,723,484. A 300-man BOQ with mess at Fort Hood, Tex. Engineer Dist., Fort Worth, Tex.
- 8-Lockheed Aircraft, Van Nuys, Calif. \$21,400,000. AH-64A Cheyenne helicopters and funding for long lead time items. Aviation Materiel Command, St. Louis, Mo. DA-23-201-AMC-03667.
- 10-Thiokol Chemical Corp., Brunswick, Ga. \$3,530,400. Loading, assembling and packing of bombs. Army Arsenal, Edgewood, Md. DA-AA-15-68-C-0341.
- Neato Products, Pottstown, Pa. \$1,291,810. Components for artillery proximity fuses. Harry Diamond Laboratories, Washington, D.C. DA-AG-39 68-C-0038.
- Hughes Aircraft, Culver City, Calif. \$2,000,000. Incoqals Night Fighter and Night Tracker (INFANT) System. Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0188.
- 11-ACF Industries, St. Louis, Mo. \$1,016,544. Metal parts for point detonating fuses for 81mm cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0291.
- Goodyear Tire & Rubber Co., Akron, Ohio. \$5,024,950. Track shoe assemblies for use on M48 tanks. St. Mary's, Ohio. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1216.
- 12-Hamilton Watch Co., Lancaster, Pa. \$3,461,823. Safety and arming devices for artillery fuses. Harry Diamond Laboratories, Washington, D.C. DA-AG39-68-C-0039.
- Philco-Ford Corp., Philadelphia, Pa. \$2,483,502. Spares for the Integrated Wide Band Communications Systems. Electronics Command, Fort Monmouth, N.J. DA-28-043-AMC-01604.
- General Motors, Cleveland, Ohio. \$2,386,476. 155mm howitzers. Army Weapons Command, Rock Island, Ill. DA-11-190-AMC-00610.
- Grand Machining Co., Detroit, Mich. \$2,020,800. 81mm mortar fin assemblies. Vero Beach, Fla. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0039.
- Litton Systems, Inc., New Rochelle, N.Y. \$1,213,401. Complete self contained communications facility. Farmingdale, N.Y. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0010.
- 13-General Motors, Detroit, Mich. \$2,644,232. Repair and replacement of government plant equipment, utilities and rental of a parking area at the Army Ammunition Plant, St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0025.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract number.

- 15—National Presto Industries, Eau Claire, Wis \$26,021,327. 105mm projectile parts Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0065.
- DeLong Corp., New York, N.Y. \$3,779,000. Piers in Southeast Asia Mobility Equipment Command, St. Louis, Mo DA-23-196-AMC-00301.
- Wagner Electric Corp., St. Louis, Mo \$2,912,760. Metal parts for 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill DA-AA09-68-C-0234.
- Lockheed Aircraft, Sunnyvale, Calif. \$1,600,000. Design and development of the military version of the six-wheel articulated vehicle. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1242.
- Western Electric, New York, N.Y. \$2,512,270. Hard site defense studies. Redstone Arsenal, Ala. Whippany, N.J. DA-38-069-AMC-00333.
- 16—Raytheon Co., Bedford, Mass. \$11,561,095. Advanced development of the SAM-D missile system. Army Missile Command, Huntsville, Ala DA-AH01-67-C-1995.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$3,430,756. Metal parts for 81mm mortars. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-178-AMC-00803.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$2,803,878. 105mm cartridge cases. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0082.
- Nu-Pak Co., Parkersburg, Pa. \$1,378,837. Rotor blade shipping and storage containers for the Iroquois helicopter. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1338.
- AVCO Corp., Stratford, Conn. \$1,106,257. Ground support equipment and special tools in support of T55-L-11 turbine engines for Chinook helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-2292.
- 17—Teletype Corp., Skokie, Ill. \$2,500,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- Texas Instruments, Dallas, Tex. \$9,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- Polan Industries, Huntington, W. Va. \$1,046,710. Infrared optical periscopes and spare heads. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0881.
- Philco-Ford Corp., Newport Beach, Calif. \$1,500,000. FY 1968 research and development on the Chaparral missile system. Anaheim, Calif. DA-AH01-68-C-0752.
- 18—Aluminum Co. of America, Pittsburgh, Pa. \$3,616,499. Motor tubes for 2.75-inch rockets. New Kensington, Pa. Plantinny Arsenal, Dover, N.J. DA-AA21-67-C-0416.
- Norris Industries, Los Angeles, Calif. \$9,956,813. 81mm projectiles and 105mm cartridge cases. Modesto, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0304.
- Southwest Truck Body Co., St. Louis, Mo. \$1,214,488. Semi-trailer mounted electronic repair shop equipment. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-2298.
- Northrop Corp., Anaheim, Calif. \$3,877,495. 106mm projectiles. Plantinny Arsenal, Dover, N.J. DA-AA21-68-C-0516.
- 19—General Motors, Detroit, Mich. \$8,091,166. Cargo pick-up trucks. Baltimore, Md.; St. Louis, Mo.; Fremont, Calif. and Atlanta, Ga. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1247.
- Sylvania Electric Products, Williams-ville, N.Y. \$1,772,862. AN/ARC-115 and 116 radio sets, direction finders AN/ARN 89 and C-653/ARC controlled communication sets. Electronics Command, Philadelphia, Pa. DA-28-043-AMC-01943.
- Ford Motors, Dearborn, Mich. \$8,000,000. Five-ton trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA-AE06-68-C-0063.
- 22—LTV ElectroSystems, Huntington, Ind. \$2,271,120. AN/PRC-25 radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0065.
- Varo, Inc., Garland, Tex. \$1,242,700. Search lights. Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0055.
- 23—Chrysler Motors, Detroit, Mich. \$5,072,785. Various trucks. Warren, Mich. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1245.
- Chicago, Rock Island & Pacific Railroad Co., Chicago, Ill. \$3,343,000. Alteration of the company bridge across the Arkansas River at Little Rock, Ark., to include an appropriate movable span with appurtenances for the passage of navigation. Engineer Dist., Little Rock Ark DA-CW03-68-C-0003.
- General Electric, West Lynn, Mass. \$2,600,000. AH56A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1630.
- Bell Aerospace Corp., Fort Worth, Tex. \$1,249,750. UH-1 helicopter main rotor hub assemblies. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0022.
- W. L. Haley & Co., Nashville, Tenn. \$1,096,240. Excavation of the Penstock Tunnel for Gaitsers Dam, Ga. Engineer Dist., Mobile, Ala DA-CW01-C-0044.
- 21—Remington Arms Co., Bridgeport, Conn. \$28,220,378. Miscellaneous small arms ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-49-010-AMC-00003.
- Columbus Milpar Mfg. Co., Columbus, Ohio 2,696,000. Metal parts for 81mm cartridge fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0300.
- American Fabricated Products, Indianapolis, Ind. \$1,180,963. Fin assemblies for 81mm mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0298.
- Page Communication Engineering, Inc., Washington, D.C. \$6,027,923. Engineering installation, operation and maintenance, and expansion of the Integrated Wide Band Communication System at various locations in South Vietnam. Electronics Command, Fort Monmouth, N.J. DA-28-043-AMC-01693.
- 25—Knoxville Acoustical Co., Knoxville, Tenn. \$1,728,541. Replacement of a building roof at the Detroit Arsenal Tank Plant, Warren, Mich. Engineer Dist., Chicago, Ill. DA-CA23-68-C-0043.
- 26—Delaware Valley Armaments, Mount Laurel, N.Y. \$4,611,600. Metal parts for artillery shell fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0204.
- Cessna Aircraft, Wichita, Kan. \$3,668,000. Bomb dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0008.
- Bulova Watch Co., Providence, RI \$3,299,186. Head assemblies for 60mm fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0077.
- AMETEK, Sheboygan, Wis. \$2,688,729. Support assemblies for 105mm cartridge containers. Plymouth, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0310.
- Beech Aircraft, Wichita, Kan. \$1,668,000. Bomb dispensers. Salina, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0009.
- St. Louis Southwestern Railway Co., Tyler, Tex. \$4,616,000. Alteration of Rob Roy Railroad Bridge, Pine Bluff, Ark., to incorporate a movable span with appurtenances for passage of navigation. Engineer Dist., Little Rock, Ark. DA-CW03-68-C-0002.
- Bogue Electric Mfg. Corp., Patterson, N.J. \$4,609,017. Generator sets. Electronics Command, Fort Monmouth, N.J. DA-11-184-AMC-00864.
- Gould National Batteries, Inc., St. Paul, Minn. \$3,047,030. M514 fuze component. Harry Diamond Laboratories, Washington, D.C. DA-AG89-67-C-0040.
- 29—Cummins Engine Co., Columbus, Ind. \$1,043,174. V8-300 diesel engines for 10-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5022.
- Ralph M. Parsons Co., Los Angeles, Calif. \$4,904,174. Architect engineer services for design of Sentinel anti-ballistic missile system radar and launch facilities. Engineer Div., Huntsville, Ala. DA-CA87-68-C-0001.
- 30—Olin Mathieson Chemical Corp., East Alton, Ill. \$5,771,626. Miscellaneous propellants. Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00106.
- Freeto Construction Co., Pittsburg, Kan. \$1,595,595. Relocation of two bridges and 9 1/2 miles of road in Polk County, Mo. Engineer Dist., Kansas City, Mo. DA-CW41-68-C-0083.
- General Motors, Cleveland, Ohio. \$1,404,732. 155mm self-propelled howitzers (M109). Army Weapons Command, Rock Island, Ill. DA-11-199-AMC-00610.
- R. G. LeTourneau, Inc., Longview, Tex. \$7,172,121. Metal parts for 750-lb. bomb. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0030.
- 31—Alcan Aluminum Corp., Riverside, Calif. \$1,629,540. Metal parts for 66mm rocket motors. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0317.
- Chrysler Motors, Centerline, Mich. \$1,492,678. Carryall and pick-up trucks. Warren, Mich. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1204.
- General Time Corp., Stanford, Conn. \$2,267,878. Mechanical time fuzes for artillery and illuminating shells. Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0223.
- Olin Mathieson Chemical Corp., East Alton, Ill. \$2,753,069. 60mm illuminating projectiles. Alton, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0320.
- Bermite Powder Co., Saugus, Calif. \$3,080,000. Loading, assembling and packing of point detonating fuzes for 20mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0420.
- Philco-Ford Corp., Philadelphia, Pa. \$1,938,680. Phase III augmentation of an integrated wide band communication system in Southeast Asia. Electronics Command, Fort Monmouth, N.J. DA-28-043-AMC-01684(E).
- Honeywell, Inc., Hopkins, Minn. \$1,992,835. Nose fuzes. Procurement Agency, Chicago, Ill. DA-AA09-68-C-0202.
- Hughes Aircraft, Culver City, Calif. \$1,396,000. Advanced production engineering for XM26 armament subsystem TOW missile for UH-1 helicopters. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1179.
- Martin-Marietta Corp., Orlando, Fla. \$1,225,000. 81,444-man-hours for industrial engineering services in support of the Pershing weapon system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0257.
- AVCO Corp., Stratford, Conn. \$2,273,000. Product support and component improvement program for T53 engines. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1546.
- Ingersoll-Rand, St. Louis, Mo. \$1,172,324. 261 sets of pneumatic tool outfits. Athens, Pa. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-5508.
- Atlas Corp. and H. C. Smith Construction Co., Oakland, Calif. \$14,187,000. Logistic support of the Kwajalein Test Site. Redstone Arsenal, Huntsville, Ala. DA-AG18-67-C-0001.
- Raytheon Co., Andover, Mass. \$9,254,000. Advanced production engineering for the improved Hawk missile system. Bedford, Mass. DA-AH01-67-C-0810; \$2,241,390. Product assurance engineering for the improved Hawk missile system. DA-61-021-AMC-11390; \$1,349,841. Industrial engineering services for the Hawk missile system. DA-AH01-C-0701. Army Missile Command, Huntsville, Ala.
- Wells Marine Corp., El Segundo, Calif. \$1,346,030. Metal parts for 20mm target practice projectiles. Frankford Arsenal, Philadelphia, Pa.
- Harvard Industries, Farmingdale, N.J. \$1,392,066. 212 electrical equipment shelters. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-1718.



DEPARTMENT OF THE NAVY

- 2—McDonnell Douglas Corp., St. Louis, Mo. \$56,800,000. To extend long authorization for F-4E, RF-4C aircraft. Naval Air Systems N00019-67-C-0171.
- Yankee-Walter Corp., Los Angeles \$3,485,062. 61 aircraft rescue trucks. Midwest Div., Nav Engineering Command, Great Neck \$62465-68-C-0126.

- Westinghouse Electric, Washington, D.C. \$2,417,026. Development of a Poseidon (C-3) missile launcher trainer Sunnyvale, Calif. Special Projects Office. N00030-68-C-0142
- General Dynamics, Pomona, Calif. \$1,734,700. Manufacture, assemble and checkout of guidance and control airframe group, improved Tartar MK 10 Mod 1, and Ht-3a Terrier MK 8 Mod 1. Naval Ordnance Systems Command. N00024-68-C-0054-F Mod 3
- 3—Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$1,099,831. Detailed plans for components, systems, and mock up for a nuclear propulsion plant. Naval Ship Systems Command. N00024-68-C-0268
- 4—Hughes Aircraft, Fullerton, Calif. \$1,175,750. Engineering services in connection with the preparation of technical manuals for the AN/SPS39 radar. Naval Supply Center Norfolk, Va. N00189-68-C-0349
- 5—LTV Aerospace Corp., Dallas, Tex. \$5,064,000. Increase in the limitation of authorization for A-7B aircraft. Naval Air Systems Command. N00019-67-C-0052
- Fairchild Camera & Instrument Corp., Syosset, N.Y. \$2,586,000. MK 83 base fuzes for 5-inch, 38-caliber projectiles. Copague, N.Y. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- Willamette Iron & Steel Co., Portland, Ore. \$2,137,500. Reactivation of the destroyer escort USS Riley (DE-579). Supervisor of Shipbuilding, Thirteenth Naval Dist., Seattle, Wash. N-62682-67-C-0021
- Stromberg Carlson Corp., San Diego, Calif. \$1,564,200. Airborne tactical display systems for ASW aircraft. Naval Air Systems Command. N00019-67-C-0097
- Magnavox Co., Fort Wayne, Ind. \$1,554,300. Classified electronic countermeasure equipment. Naval Air Systems Command. N00019-68-C-0280
- Hazeltine Corp., Little Neck, N.Y. \$1,416,220. Airborne interrogator sets. Naval Air Systems Command. N00019-67-C-0856
- Tracor, Inc., Austin, Tex. \$1,302,952. Chaff dispensers. Naval Air Systems Command. N00019-68-C-0279
- Avondale Shipyards, Westwego, La. \$1,132,264. Regular overhaul of the minesweepers USS Vigor (MSO-473) and USS Vital (MSO-474). Avondale, La. Supervisor of Shipbuilding, Eighth Naval Dist., New Orleans, La.
- 8—Oshkosh Truck Co., Oshkosh, Wis. \$1,604,496. MB-5 aircraft rescue fire-fighting trucks. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill. N62465-68-C-0101
- Condee Corp., Old Greenwich, Conn. \$5,236,324. \$3,529,727. Various diesel engine generator sets. Headquarters, Marine Corp. N00027-68-C-0121. N00027-68-C-0120
- 9—United Aircraft, East Hartford, Conn. \$11,037,390. Additional funding for TF30 engines. Naval Air Systems Command. N00019-67-C-0332
- General Signal, Inc., Woodbury, N.Y. \$1,740,000. Manufacture of active read-out decoders. Naval Electronic Systems Command. N00024-67-C-1405
- Basic Construction Co., Newport News, Va. \$1,492,100. Construction of an addition to the Polaris Training Building at the Guided Missile School, Dam Neck, Va. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. Nby-88333
- 10—Columbia University, New York, N.Y. \$2,989,000. Complete additional research in underwater and related subjects. Office of Naval Research.
- 11—Sperry Gyroscope Co., Great Neck, N.Y. \$2,536,000. Engineering services in performing a development program on AN/SPG-55A/B radar and related equipment. Naval Ordnance Systems Command. N00017-68-C-2308
- Columbus Milnar & Mfg. Co., Columbus, Ohio. \$1,400,000. Assembly and loading program. Navy Ship Parts Control Center, Mechanicsburg, Pa.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$1,802,352. Development of an improved telemetry system for the Polaris A-3 missile. Special Projects Office. N00030-68-C-0084
- Detyens Shipyards, Wando, S.C. \$1,265,063. Overhaul and modification work on four ocean minesweepers. Supervisor of Shipbuilding, Sixth Naval Dist. N-62673-67-C-0002
- Sperry Rand, St. Paul, Minn. \$1,074,863. A developmental model of a Tactical Data System Computer. Naval Ship Systems Command. N00024-68-C-1107
- 12—RCA, Van Nuys, Calif. \$1,420,000. Classified electronics equipment. Naval Ship Systems Command. N00024-68-1143
- Sperry Rand Corp., Syosset, N.Y. \$1,329,000. Navigational-analog digital computer converters, supporting spare parts, technical data, and test equipment. Naval Ship Systems Command. N00024-68-C-5199/FBM
- 15—Norris Industries, Vernon, Calif. \$5,401,200. Rocket assisted projectile warhead and motor cases. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0323
- 16—General Electric, Syracuse, N.Y. \$30,000,000. Sonar sets, with associated support equipment, data, and technical services. Naval Ship Systems Command. N00024-68-C-1130
- Sanders Associates, Inc., Nashua, N.H. \$15,318,704. Electronic equipment. Naval Air Systems Command. N00019-67-C-0356
- 17—Columbus Milnar & Mfg. Co., Columbus, Ohio. \$3,007,750. Inert parts assembly for the 5-inch spin stabilized rocket motor. Navy Ship Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3436
- General Electric, Binghamton, N.Y. \$1,740,490. Autopilots. Naval Air Systems Command. N00019-68-C-0306
- Abbott Construction Co., Chicago, Ill. \$1,560,000. Construction of barracks at the Naval Hospital Corps School, Great Lakes, Ill. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill.
- 18—Sewart Searcraft, Berwick, La. \$1,956,566. Design, development and construction of two prototype armed troop carrier/command control boats and associated technical data and reports. Naval Ship Systems Command. N00024-68-C-0214
- 19—United Aircraft, Windsor Locks, Conn. \$2,570,814. Propeller system for P-3C aircraft. Naval Air Systems Command. N00019-68-C-0123
- Louis Demarkus Corp., Buffalo, N.Y. \$1,921,878. Carbon dioxide removal plants for submarines. Naval Ship Systems Command. N00024-68-C-5216
- Western Electric, New York, N.Y. \$1,541,233. Sonar classification sets for shipboard use. Burlington, N.C. Naval Ship Systems Command. N00024-68-C-1103
- 22—General Electric, New York, N.Y. \$7,000,000. Airborne data processing systems. Naval Air Systems Command. N00019-68-C-0245
- United Aircraft, Stratford, Conn. \$6,845,000. Airframe parts for CH-53A helicopters. Aviation Supply Office, Philadelphia, Pa. N00388-8-91015A-AB223
- Gunderson Bros. Engineering Corp., Portland, Ore. \$4,000,000. Construction of assault support boats and minesweeper river boats. Naval Ship Systems Command. N00024-68-C-0286
- Clymer Machine Co., Trumbauersville, Pa. \$1,071,000. Five-inch, 38-cal. projectile fuzes. Navy Ship Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3312
- Hercules, Inc., Wilmington, Del. \$1,654,997. Nitrocellulose for use in production of cannon powder. Parlin, N.J. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0341
- Columbia University, New York, N.Y. \$1,161,162. ASW surveillance research. Office of Naval Research.
- 23—Liton Systems, Woodland Hills, Calif. \$1,680,779. Inertial navigation systems. Naval Air Systems Command. N00019-67-C-0623
- 25—General Dynamics, Pomona, Calif. \$4,000,000. Standard Arm missiles. Naval Air Systems Command. N00019-67-C-0399
- General Electric, Utica, N.Y. \$3,666,075. Guidance and control groups for Chaparral missiles. Naval Air Systems Command. N00019-68-C-0322
- Raytheon Co., South Lowell, Mass. \$2,686,585. Guidance and control groups for Chaparral missiles. Naval Air Systems Command. N00019-68-C-0323
- 26—Bendix Corp., Teterboro, N.J. \$4,930,023. Poseidon (C-3) missile inertial components. Special Projects Office. N00030-68-C-0169
- H. W. Stanfield Co. and S. L. Hahn, Inc., San Diego, Calif. \$1,419,331. Construction of a Navy Exchange Service Center at the San Diego Naval Station. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3190
- Arthur D. Little, Inc., Cambridge, Mass. \$1,107,788. Technical consultation and engineering assistance. Naval Ship Systems Command. N00024-68-C-1137
- General Motors, Goleta, Calif. \$1,000,000. Continuation of current efforts to establish the design, development, test program and qualification of a warhead and explosives for MK 48 MOD 0 torpedoes. Naval Ordnance Systems Command. N00017-67-C-1218
- 30—General Electric, Washington, D.C. \$7,204,616. Poseidon (C-3) training facilities. Pittsfield, Mass. Special Projects Office. N00030-67-C-0050
- Dale Electronics, Inc., Yankton, S.D. \$5,842,347. M900 E4 bomb fuzes for Snakeeye missiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3494
- General Instrument Corp., Chichester, Mass. \$5,606,642. M900 E4 bomb fuzes used on Snakeeye. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3493
- RCA, Van Nuys, Calif. \$1,047,072. MK 2 MOD 0 safety devices for Snakeeye. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3495
- Condor Industrial Corp., Wheaton, Ill. \$1,084,568. MK 26 MOD 0 safety device for Snakeeye. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3496
- Honeywell, Inc., Hopkins, Minn. \$3,270,758. Design and development of a low speed fuel-air-explosive weapon system. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-0436
- Curtiss-Wright Corp., Wood-Bridge, N.J. \$1,207,734. Spare parts in support of R3350-W26 engines for A-1E aircraft. Navy Aviation Supply Office, Philadelphia, Pa. F41608-67-A-5900-GBGCJ
- Kilgore Corp., Toone, Tenn. \$1,041,000. MK 26 MOD 3, marine markers. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3474
- Amecom, Silver Spring, Md. \$1,206,021. Conversion of classified electronic countermeasures sets, including engineering services, equipment repair parts and associated data. Naval Ship Systems Command. N00024-67-C-1533
- 31—Vitro Corp. of America, Silver Spring, Md. \$13,544,736. Engineering and support services and facilities for Terrier, Tartar, Talos, Standard and Point Defense missiles. Naval Ordnance Systems Command. N00017-68-C-4401
- Raytheon Co., Lexington, Mass. \$3,604,000. Sparrow III missiles and related equipment. Lowell, Mass. N00010-68-C-0225
- Data Products Corp., Culver City, Calif. \$1,442,080. Line computer printers and associated support items. Naval Ship Systems Command. N00024-68-C-1136



DEPARTMENT OF THE AIR FORCE

- 2—Loral Corp., Bronx, N.Y. \$2,322,288. Work on an electronic countermeasure system. Warner-Robins Air Materiel Area (AFSC), Robins AFB, Ga. 83067-68-C-0531
- United Aircraft, West Palm Beach, Fla. \$3,300,000. Advance development program to demonstrate a high performance reusable oxygen-hydrogen rocket engine. Air Force Flight Test Center, (AFSC), Edwards AFB, Calif. AF-04611-68-C-0600
- LTV Corp., Dallas, Tex. \$3,000,000. Development work on space vehicle. Space & Missile Systems Organization (AFSC), Los Angeles, Calif. AF-04 608 1050
- Philco-Ford Corp., Palo Alto, Calif. \$3,500,000. Work on a satellite control system. Space & Missile Systems Organization (AFSC), Los Angeles, Calif. AF 04701-68-C-0080

- 3-Jet Avion Corp., Hialeah, Fla. \$1,265,519 Production of spare parts for J-57 and TF-33 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-C-1404.
- 4-Electronic Communications, Inc., St. Petersburg, Fla. \$2,001,060 Production of airborne electronics equipment for C-135 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-67-C-3714 P001
- General Electric, West Lynn, Mass. \$38,228,200 Production of J-85 aircraft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-1659.
- Lockheed Aircraft, Burbank, Calif. \$1,747,000. Production of spare parts for F-104 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F0406-67-A-0385-SC-01.
- 5-Hazeltine Corp., Little Neck, N.Y. \$3,736,260 Production of receiver-transmitter systems for aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0610
- Philco-Ford Corp., Palo Alto, Calif. \$1,800,000. Logistics support of the satellite control network Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0060.
- 9-A. J. Industries, Inc./Sargent Fletcher Co., El Monte, Calif. \$1,217,222. Production of external fuel tanks for A-7 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-F33-667-68-C-0702
- Batesville Mfg. Co./Camden Mfg. Co., Camden, Ark. \$4,496,500. Production of aircraft ordnance. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-F-33657-68-C-0733.
- Collins Radio Co., Cedar Rapids, Iowa \$3,280,155. Production of radio receiver equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF-F34601-67-A-2108-02-3.
- Stanley Aviation Corp., Denver, Colo. \$1,865,000. Production of escape system modification kits for T-28 aircraft. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif. AF-F-04-680-67-C-2-180-P008.
- 10-Boeing Co., Seattle, Wash. \$9,295,000. Production of Minuteman missiles. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04694-67-N-0119.
- 11-General Electric, Arkansas City, Kan. \$1,887,136. Overhaul and modification of F-35 engines and components. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-67-C-5321-P003.
- 12-Perkin Elmer Corp., Norwalk, Conn. \$1,300,100. Manufacture of LASER reconnaissance sets. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-F33657-68-C-0076-0004.
- 15-Maytronics, Inc., Colorado Springs, Colo. \$2,198,601. Production of electro-optical systems and related equipment. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF-F09603-68-C-0810.
- 16-North American Aviation, Anaheim, Calif. \$12,000,000. Production of depot maintenance equipment to support the Minuteman missile program. Space & Missile Systems Organization, AFSC, Los Angeles, Calif. AF-04-(694)-687.
- Batesville Mfg. Co., Camden, Ark. \$1,626,552. Production of bomb containers and dispensers. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-F33657-68-C-0426.
- Aerodex, Inc., Miami, Fla. \$1,448,714. Overhaul of reciprocating aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF-F41608-68-C-0016.
- 17-Maxson Electronics Corp., Great River, N.Y. \$6,186,000. Fuse assemblies for various aircraft bombs. Macon, Ga. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF-F34601-67-A-2198.
- 18-Lockheed Missile & Space Co., Sunnyvale, Calif. \$5,700,000. Agena launch services at Vandenberg AFB, Calif., for period Oct. 1, 1967-Sept. 30, 1968. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0070.
- AirResearch Mfg. Co., Phoenix, Ariz. \$1,764,636. Production of gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-2390.
- Norair Engineering Corp., Washington, D.C. \$4,546,020. Construction of 250 family housing units at Andrews AFB, Md. F49642-68-C-0148.
- Collins Radio Co., Richardson, Tex. \$7,090,000. Production and installation of high frequency single-sideband ground/air/ground communication facilities. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-2471
- Bolt, Beranek & Newman, Cambridge, Mass. \$1,750,000 Development of prototype techniques for communicating with computer networks and measuring the processes of man/computer systems. Electronic Systems Div., (AFSC), L. G. Hancock Field, Mass. F19628-68-C-0125.
- 19-C. E. W. Womack, Inc., Virginia Beach, Va. \$1,524,100 Construction of 100 family housing units at Langley AFB, Va. 4500th Air Base Wing, Langley AFB, Va. F44600-68-C 0129
- General Motors, Hudson, Ohio \$1,956,178. Production of heavy loading equipment with adverse terrain capability. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F3667 67-C-1370 P006
- 23-Modulux, Inc., Newark, Calif. \$1,542,462 Manufacture of modular relocatable buildings in support of Southeast Asia requirements. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF-09693-68-C-1307.
- Hercules, Inc., Wilmington, Del. \$1,834,672. Production of Stage III Minuteman II missile motors. Magna, Utah Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF-04(691)-903.
- 24-A. J. Industries, El Monte, Calif. \$3,695,474. Production of fuel tank assemblies for F-4C aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF-42(600)-40585.
- Cornell Aeronautical Laboratory, Buffalo, N.Y. \$1,800,000. Analysis and evaluation of the effectiveness of penetration aids. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-3616 68-C 1819.
- 25-LTV Electrosystems, Inc., Greenville, Tex. \$2,000,000 Modification of C-130 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68 C-0707.
- Electronic Communications, Inc., St. Petersburg, Fla. \$1,804,696. Production of communications equipment for C-135 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF-096030-68-0-A-0211-0006.
- 26-Lockheed Aircraft, Sunnyvale, Calif. \$5,000,000. Operation and maintenance of the satellite test annex and the Vandenberg tracking station of the Air Force Satellite Control Facility. AF 04701-68-C-122: \$2,000,000. Operation and maintenance of tracking stations in Hawaii and Kodiak, Alaska. AF-04701 68-C 0104 Headquarters, Air Force Satellite Control Facility, Los Angeles, Calif.
- Northeast Construction Co., Albuquerque, N.M. \$4,763,202. Construction of 300 family housing units at England AFB, La. Procurement Div., England AFB, La. AF-16600-68-C-0160.
- North American Rockwell Corp., Anaheim, Calif. \$1,760,000. Overhaul and repair of air-to-ground missile parts and components. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF-34601-68-C-0083.
- LTV, Greenville, Tex. \$1,572,998. Inspection and repair of F and TF-102 aircraft. Greenville, S.C. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF-41608-68-C-0033.
- 29-Duehler-Jarvis Co., Toledo, Ohio. \$3,132,983. Aircraft bomb components. Batavia, N.Y. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF38657-68-C-0775.
- Honeywell, Inc., Hopkins, Minn. \$8,851,020. Aircraft bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-33657-68-C-0776.
- 31-Chromalloy American Corp., New York, N.Y. \$1,571,800. Repair and application of protective coating on J57 engine turbine nozzle guide vanes. Gardnena, Calif. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
- Aerojet General, Downey, Calif. \$15,830,000. Production of aircraft ordnance. Batesville, Ark. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF-33(667)-16753.
- General Motors, Indianapolis, Ind. \$1,999,000. Development work on an advanced turbine engine gas generator. Aeronautical System Div., (AFSC), Wright-Patterson AFB, Ohio. AF-33(657)-68-C-0363.
- United Aircraft, Hartford, Conn. \$1,000,000. Development work on an advanced turbine engine gas generator. Aeronautical System Div., (AFSC), Wright-Patterson AFB, Ohio. AF-33657-68-C-0362.
- Fluidgenics Co., National City, Calif. \$1,949,378. Ground test equipment for test and calibrating aircraft data computing systems. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF-41608-68-D-8125.
- Hayes International Corp., Dothan, Ala. \$1,338,225 Inspection, repair and modification of C-118 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF-09603 68-C-0173.

Report on Defense Industry Profit Review Available

Release has been made of the initial report based upon a study, performed for the Defense Department by the Logistics Management Institute, to develop a method for providing DOD with visibility over realized profits of defense contractors. The study endeavors to measure profit trends by size of company and type of contract, and to compare trends on both defense and commercial business.

The report is titled "Defense Industry Profit Review." Authorized defense contractors and grantees may obtain this document (Control No. AD 664-700 for Volume 1, AD 664-701 for Volume 2), without charge, from the Defense Documentation Center, Cameron Station, Alexandria, Va. 22314. It is also available for purchase at \$3 for the entire report from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Va. 22151.

Symposium Scheduled on Night Combat Operations

The Defense Department and the National Security Industrial Association will hold a classified symposium on April 30-May 2. The sessions will be conducted at the National Bureau of Standards, Gaithersburg, Md.

Purpose of the symposium is to focus attention of the industrial community on needs of the Military Services to improve their ability to fulfill missions at night and under conditions of limited visibility.

For additional information, the contact is: National Security Industrial Association, 1030 15th Street NW, Washington, D.C. 20005, Telephone: (202) 298-2266.

OFFICIAL BUSINESS

U.S. Air Force "Bare Base" Concept Expected To Be Operational by 1970

Transport an air base the size of a small city half-way around the world and have it ready for combat operations within a matter of hours?

No longer is this just a military strategist's dream. Such tactical air mobility will become a reality in 1970 when the Air Force hopes to put its "bare base" concept into operation.

The new concept envisions the development of highly mobile facilities which can be flown to an advanced site and erected immediately to provide the essential elements for a suitable operational base.

Such facilities would include hangers, barracks, dining halls, communications centers, dispensaries and maintenance shops as well as various essential equipment required to sustain operations.

Reduced weight and volume, simplicity in operation and dual uses for certain types of equipment are required to achieve the improved speed and air mobility sought in the bare base idea.

In the planning stage are structures which would double as storage containers in the air transport mode, and then expand to three times their size to be used as living quarters or maintenance shops.

Other items under study include a family of sectionalized equipment for the construction work necessary to establish an operational base swiftly, an air-transportable vacuum cleaner capable of cleaning a 7,000-foot runway in one hour, new storage structures composed of fabric one-half the weight of present tents and with flooring one-quarter the usual weight, and advances in electrical power and lighting and water distribution systems.

All equipment being designed for bare base use will have a minimum life of five years, averaging two moves per year. Storage life of the equipment will be 10 years.

Colonel William D. Baxter heads the Bare Base Office, which is part of the Operations Division of the Deputy for Limited War, Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio.

Navy League National Convention To Be Held in Hawaii, April 21-27

The 66th annual national convention of the Navy League of the United States will be held April 21-27 at the Hawaiian Village Hotel, Honolulu, Hawaii.

"Hawaii—Pacific Keystone of Power" is the theme of this year's convention. Key speakers will be the Secretary of the Navy, Chief of Naval Operations, and the Commandant of the Marine Corps.

Highlights of the convention will be briefings by the Commander-in-Chief, Pacific; Commander-in-Chief, Pacific Fleet; and Commander, Fleet Marine Force, Pacific.

Also included in this year's program are Navy and Marine Corps presentations, a Marine Corps firepower demonstration at Kaneohe, and performance by the Navy Blue Angels flight demonstration team.

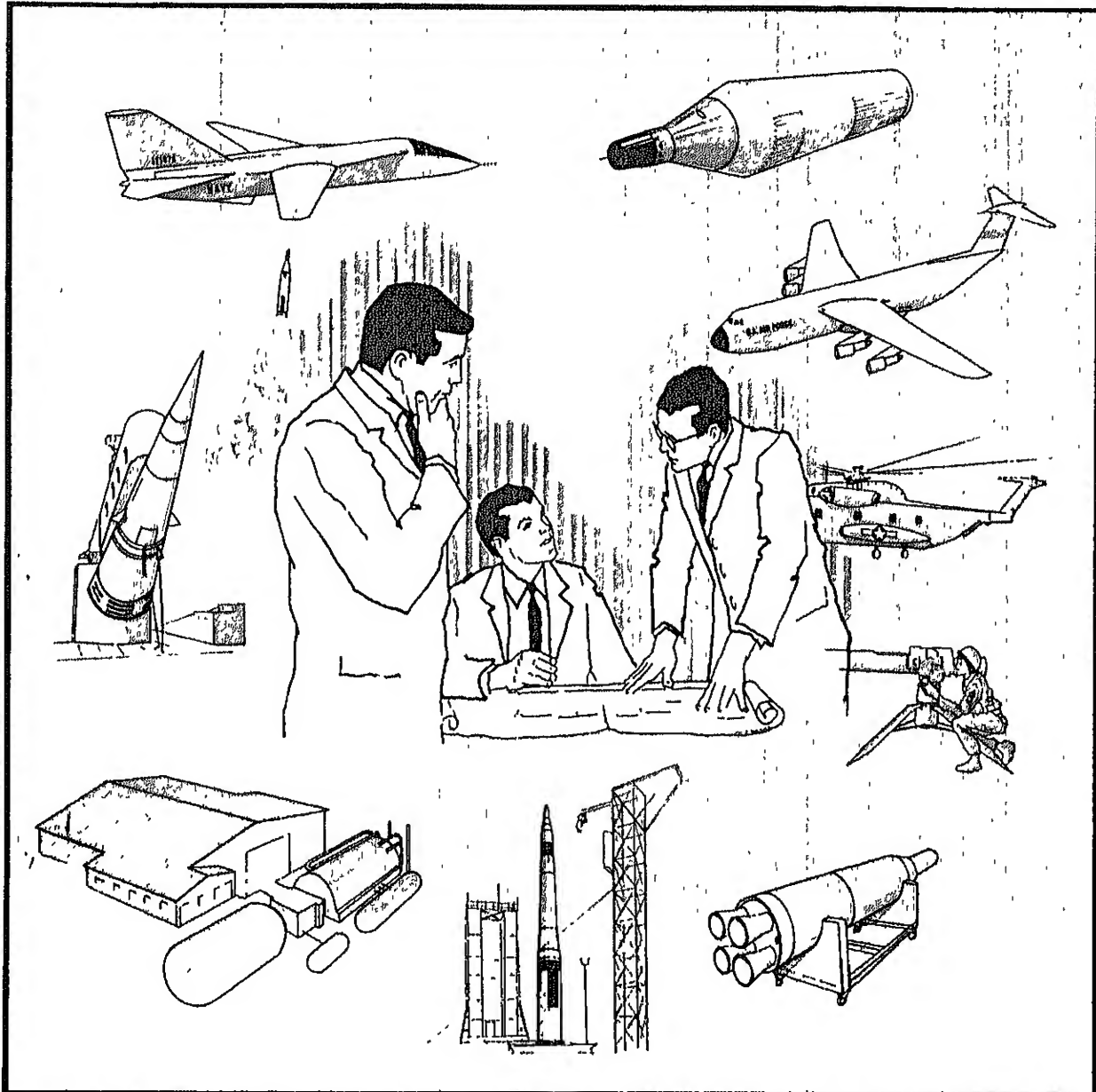
For additional information on the convention, the contact is: Dale M. Shear, Convention Coordinator, Navy League of the United States, 818 18th Street NW, Washington, D. C. 20006, Telephone: (202) 298-9282.



DEFENSE INDUSTRY BULLETIN

Vol. 4 No. 4

April 1968



DEFENSE RESEARCH, DEVELOPMENT, TEST AND EVALUATION PROGRAM

(Excerpts from statement by Dr. John S. Foster Jr., Director of Defense Research and Engineering, on the FY 1969 Defense, Research, Development, Test and Evaluation Program before the Senate Committee on Armed Services begins on page 27.)

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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

The *Bulletin* is distributed without charge each month to representatives of industry and agencies of the Department of Defense, Army, Navy and Air Force. Subscription requests should be made in writing on letterhead and addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301.

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Programs and Services of the Defense Documentation Center

Robert H. Rea

The outpouring of scientific and technical reports, generated by defense expenditures for research and development, is enormous. The reports contain the intangible yet principal product of the research and development efforts—knowledge. As part of a continuing cycle, the knowledge or information contained in these technical reports can be used by others in current research and development problems and projects.

Approximately \$7 billion will be allocated to defense research, development, test and evaluation (RD-T&E) projects during the current fiscal year. The projects, and the reports generated through these expenditures, will cover virtually every area of science and technology. An engineer or scientist can be hopeful, then, that in some of these reports are the findings, formulas, procedure descriptions, or other information that he needs to accelerate his own efforts. Occasionally the needed information is contained in reports produced one or two decades ago. Just where are these reports now, and what aids are there to retrieve those which have most of the data he needs? And—very important—how can he get copies of these reports quickly?

If that scientist or engineer is associated with an organization within the Federal research and development community—Federal agencies, their contractors, subcontractors and grantees, a principal source of pertinent scientific and technical reports would be the Defense Documentation Center (DDC).

DDC, a major field activity of the Defense Supply Agency, is the central facility within DOD for secondary distribution of RDT&E documents. The center acquires, processes, stores, announces and provides copies of technical reports to organizations

within the Federal research and development community. DDC services are provided without charge to organizations eligible and registered for service.

The center's technical report service is based on the concept that a technical report increases in value each time the information it contains is put to further use. During 1967, DDC received requests for about two million copies of these reports for application to current programs.

Some 2,700 contractor organizations, including many of our nation's largest and smallest research and development organizations, have been exploiting the technical report program and related services offered by DDC. An equal number of military

activities and about 550 other Federal users also are tapping this reservoir of technical information.

To assist organizations in registering for DDC services, the center provides a pamphlet entitled "Registration for Department of Defense Scientific and Technical Information Services." The pamphlet outlines registration procedures and is complete with copies of the DOD forms required.

The principal form used in registering for service is the DD Form 1540, titled "Registration for Scientific and Technical Information Services." It is the only form required of military organizations for service.

The completion and submission of the DD Form 1540 by contractors, subcontractors and grantees varies according to whether the request includes classified document service. Directions for these procedures are specific within the pamphlet.

If classified service is requested by any organization other than military, the use of DD Form 1541, titled "Facility Clearance Register," is also required. Two copies of this form are forwarded to the cognizant Defense Contract Administration Services Region (DCASR) for certification. In essence, the Form 1541, when approved and forwarded by the DCASR to DDC, verifies that the facilities of the requesting organization have been inspected and have been found proper to protect the classified documents which would be provided to that organization.

Potential defense contractors may also use the services of the center through individual programs established by the Military Departments; an example is the Air Force Technical Objectives Document (TOD) program.

Readers associated with organizations not eligible for DDC services



Robert H. Rea has served with the Defense Documentation Center since 1961 and is presently assigned as a liaison officer in the Office of Customer Relations. In previous assignments, he served as the editor of the *Technical Abstract Bulletin* and as a subject analyst. Mr. Rea holds a bachelors degree from Pennsylvania State University and a masters degree from American University.

may be interested in the services offered by the Department of Commerce through the Clearinghouse for Scientific and Technical Information, 5285 Port Royal Road, Springfield, Virginia 22151. The clearinghouse makes unclassified reports of the Defense Department and other Federal agencies available to the public at nominal cost.

DDC's technical report collection exceeds 850,000 titles. Documents collected by the center's predecessor organizations (The Armed Services Technical Information Agency, Central Air Documents Office, and the Navy Research Section of the Library of Congress) stem from the years during and following World War II, and include documents captured from the Germans and Japanese during the later phases of that war. Although hard copies of documents from the early collections have been retired, reproductions can still be made available by DDC from copies stored through microphotography.

Information on about half a million of the reports is stored in the center's computers. In the wide subject area of physics, there are more than 70,000 reports under computer control for quick retrieval. Nearly 50,000 of the reports are in the electronics and electrical engineering area, and about 40,000 concern studies in navigation, communications and detection equipments. These are only three of a wide range of subject areas used to index reports at DDC. Within many of these documents are the answers, or at least time-saving guides, concerning problems being worked on today throughout the Federal research and development community.

Documents in the collection range from unclassified to Secret and Restricted Data reports. They reflect billions of dollars expended over the defense-related research programs. For example, the collection through developing to studies

through full development.

Currently, some 50,000 technical documents are being added to the collection each year. The reports are furnished by military activities, either directly or through industrial,

educational, or non-profit agencies working under contract agreements or grants.

DOD directives require that defense activities, their contractors, subcontractors and grantees provide DDC with 20 copies each of the technical reports which formally record the results of defense efforts in research and development. The 20 copies are sufficient to respond to the average number of requests per technical report. These documents are screened on arrival at the center to make certain they contain information of scientific and technical value, that they are not duplicates of documents already in the collection, and that any limitations on distribution are worded in accordance with DOD Directive 5200.20.

A control (Accession Document or AD) number is stamped on each copy of a particular title. Of the 20 copies received, one is used for processing and is photographed for microfiche storage; the other 19 are used for response to user's requests for copies of the report. If additional copies are needed, they are reproduced from microfiche at the center.

For announcement purposes, technical reports accessioned by DDC are categorized in a two-level arrangement consisting of 22 major subject fields, with a further subdivision of the fields into 188 subject groups. Except for an extension of 10 additional subject groups, this is the standard which was developed through the Committee on Scientific and Technical Information (COSATI) of the Federal Council on Science and Technology. The standard is titled the "COSATI Subject Category List" (AD-612 000). The version used by DDC is "COSATI Subject Category List (DOD Extended)" (AD-624 000).

The 22 broad subject fields are

- Aeronautics.
- Agriculture.
- Astronomy and Astrophysics.
- Atmospheric Sciences.
- Behavioral and Social Sciences.
- Biological and Medical Sciences.
- Chemistry.
- Earth Sciences and Oceanography.
- Electronics and Electrical Engineering.
- Energy Conversion (Non-propulsive).



Nearly two million copies of technical reports were mailed in 1967 to the 6,000 Federal and civilian organizations registered for DDC services.

- Materials.
- Mathematical Sciences.
- Mechanical, Industrial, Civil and Marine Engineering.
- Methods and Equipment.
- Military Sciences.
- Missile Technology.
- Navigation, Communications, Detection and Countermeasures.
- Nuclear Science and Technology.
- Ordnance.
- Physics.
- Propulsion and Fuels.
- Space Technology.

DDC announces the existence and availability of documents accessioned through its own announcement publication and through announcement media of the Department of Commerce.

Classified reports and unclassified reports, having limitations on distribution, are announced in the Confidential *DDC Technical Abstract Bulletin* (TAB). Announcements of unclassified reports, having no distribution limitations, are announced with similar reports produced by other Federal agencies in the *U.S. Government Research and Development Reports* (USGRDR), published by the Clearinghouse for Federal Scientific

and Technical Information of the Department of Commerce (\$22.00 per year). TAB and the unclassified USGRDR are each distributed twice a month.

Companion index volumes are available with each issue of the aforementioned announcement publications to aid the user in determining quickly which, if any, new accessions to the collection are of particular interest. Each of these reference tools includes a Corporate Author-Monitoring Agency Index, Subject Index, Personal Author Index, Contract Number Index, a Report Number (or correlation) Index, and a Release Authority Index. TAB indexes are cumulated quarterly and annually as references to the collection.

Registered user organizations may request copies of the technical reports in either full-size or microform. Technical reports accessioned by DDC since Aug. 1, 1965, are stored on microfiche; documents accessioned earlier are stored on microfilm.

Upon registration, the organization is sent a deck of punch cards (DDC Form 1) which are used for requesting copies of technical reports. The

user code number assigned to the organization has been key-punched in the form. To request a document, the scientist or engineer need only record the control number of the report, the contract or grant number under which he is requesting service (if non-government user), the date of the request, and indicate whether he wants a full-size copy of the report or microform copy.

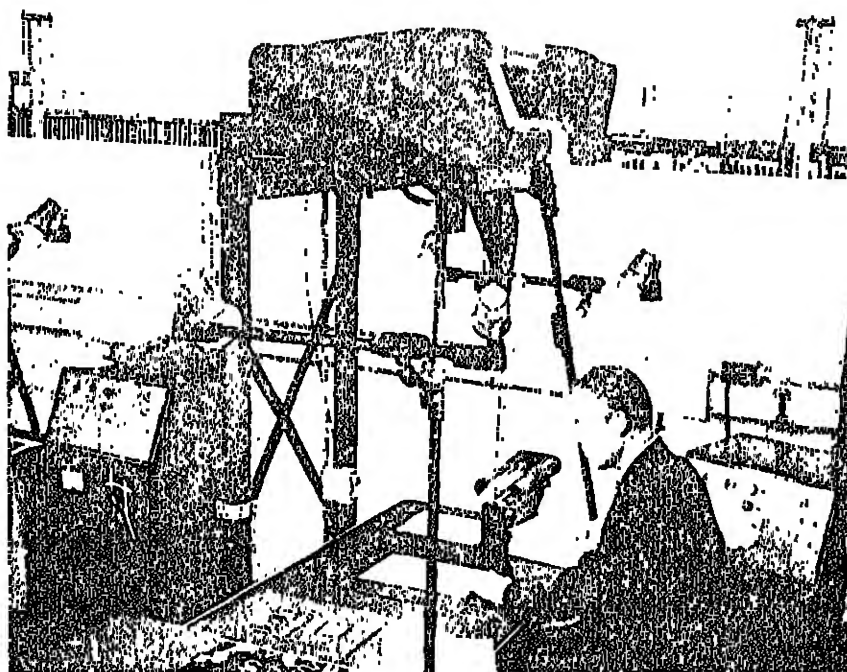
On occasion, a user will learn of a report which he believes should be in the DOD collection, but is unable to determine the information concerning the document. If he provides sufficient descriptive information concerning the report on the reverse side of the Document Request Form, DDC will make a search to determine its AD number and provide a copy of the report, if it can be released to the requester. If the report is not in the collection and sufficient identification has been provided, DDC will take action to acquire the report.

DDC receives about 8,000 requests for reports on the average workday. The requests are computer processed to match the information on the request forms with information concerning user organizations, and with document inventory and release information stored on magnetic tape. When appropriate, the computer determines the validity of the request based on security classification, need-to-know, and distribution limitations.

The average document request processing time within DDC varies from two days, if the report is in stock, to five days, if the report has to be reproduced. Actual portal-to-portal time for the requests depends on the postal service.

Approximately one-fourth of the requests received are for copies of documents in microfiche form. Industry is finding that this "new" microform is easier and less expensive to store, retrieve and reproduce than either full-size copy or microfilm. The latter had been the center's principal medium of microstorage.

DDC's microfiche are produced in accordance with the Federal Microfiche Standards. The size of the sheet film is approximately four-by-six inches. The center's format permits up to 58 page-microimages to be stored on the first sheet of microfiche and up to 70 microimages on succeeding sheets.



Technical reports accessioned by DDC are permanently stored on microfiche. Copies of the reports are available in full-size or in microform.

Using the microfiche medium, today's engineer can maintain his personal library of thousands of reference documents in just one desk drawer. To use the data, he would need only a microform reader, and many of these are being manufactured in sizes compact enough to be listed and priced as desk accessories.

The announcement publications are effective in disseminating information on documents currently accessioned. But how does a user get information on documents produced a year, a decade, or even a quarter century ago?

As a related function within the technical report program, DDC provides a bibliography service to registered user organizations. Through this service, the center produces listings which describe technical reports in the collection relating to particular subject areas.

Bibliographies at DDC take two forms. The first is a printed bibliography that is prepared for those subject areas for which numerous requests for bibliographies are anticipated. A typical example would be a bibliography on shock and vibration environment. Such bibliographies are added to the DDC collection complete with accession document (control) numbers and announced in TAB. They are requested by user organizations in the same manner as other documents in the collection.

The second type of bibliography, demand bibliography, is prepared in response to a specific request for references to technical reports which cover a particular research problem or project. A user submits a bibliography request (DDC Form 4) on which he gives pertinent information including the organization and its address, the contract or grant number (if appropriate), and user code number, and then, in as specific terms as possible, describes his research problem or project. An important item of information to be included with the request is the name and telephone number of the person who is going to put the information to use. Then, if the description of the need for the bibliography is not specific enough, a bibliographer at DDC will contact that individual and try to arrive at the required specificity.

A computer search strategy is prepared from the information on the bibliography request. The resultant computer printout contains descriptions of documents in the collection which are most pertinent to the user's needs. The more than 21,000 requests for bibliographies received in 1967 were processed, within the center, in an average of two and one-half workdays each.

Research and Technology Work Unit Information System

While DDC is a principal source of technical reports on completed research and development, it is also a central source of management and technical information concerning defense-sponsored research and exploratory development efforts currently in progress. The program, which has a tremendous potential for improving management efficiency of the defense research and development effort, is titled "Research and Technology Work Unit Information System."

Essentially, the purpose of the Research and Technology Work Unit Information System is to provide the means to determine quickly who is doing what research, when, where and how. At the end of 1967, this data bank contained more than 24,000 resumes of current efforts in the budget categories 6.1 (Research) and 6.2 (Exploratory Development), as well as selected program elements in 6.3 (Advanced Development) and 6.5 (Management and Support).

There are as many questions that can be put to this information system as there are combinations of elements included on the Research and Technology Resume. Samples of such queries to this data bank are:

- List all defense contracts or grants supporting research in foreign universities.
- Describe all projects supported by the Air Force on flutter of panels.
- Provide list of all military laboratories performing research on ceramics and graphite.
- Who is doing what work on solid propellant rocket engines and what organizations are supporting them?

Input to this data bank is in the form of "work unit" descriptions.

For purposes of these technically oriented descriptions, a work unit is defined as the smallest segment into which a project is divided for control purposes at the local organizational level. DOD instructions require that a resume be submitted to DDC for each work unit performed or sponsored by a defense activity.

Information provided through the resume includes title of the effort, originating and performing activities, contract or grant numbers, key dates, and task approach. After initial processing at DDC, the information is fed into the center's computer to provide various types of technical and management information as needed.

The data bank also includes resumes submitted by the National Aeronautics and Space Administration (NASA), which established the system jointly with the Defense Department. DOD and NASA use essentially the same input information.

The Research and Technology Work Unit Information System is designed to provide rapid response to requests in either standard or customized formats. Users may request information in the form of statistical summaries, tabulations, or complete or partial printouts of selected resumes. The physical arrangement of information is up to the requester, who is asked to provide a rough layout of the format he desires. He can indicate the title, the columnar headings, and stub entries to be used on the report.

If the request produces a voluminous report, the user may ask that a table of contents be included. If he wishes access to the report from more than one aspect, he may also obtain a subject index. Historical data concerning the work units completed or terminated can be included, if needed. If the report is to be prepared on a recurring basis, the user determines how often it will be produced, e.g., quarterly, annually. DDC provides informational materials which describe the options available for requests and provide guidance in making the most effective use of the Research and Technology Work Unit Information System.

The Research and Technology Work Unit Information System is a developmental program, the value of which increases the more it is used.

Information from this data bank can be helpful in:

- Preventing costly duplication of effort already performed, or being performed, by others.

- Keeping scientists, engineers, managers and planners abreast of the current state of the art.

- Providing a means for scientists and engineers to learn the organizations and personnel who are performing similar or related tasks, thus providing for greater coordination of effort.

- Speeding product and process development and improvement.

Access to the Research and Technology Work Unit Information Sys-

tem, currently, is limited to Federal agencies. Plans are being formulated, however, to provide limited access to this data bank to non-government organizations within the Federal research and development community.

Other DDC Functions

DDC also operates an Information Sciences Technology Data Bank for the COSATI Panel on Information Sciences Technology; and maintains reports concerning Contractor Performance Evaluations and Contractor Cost Reductions for use by selected military procurement organizations. As a subset of the Research and Technology Work Unit Information

System, the center also operates the Interagency (NASA and DOD) Life Sciences Supporting Space Research and Technology Exchange (ILSE).

The center is responsible for the development of long-range concepts and requirements for new DOD documentation and information systems, services and products. The development program, under the policy guidance of the Director of Defense Research and Engineering, is concerned with customer requirements, the state of the art of technologies concerned with information storage and retrieval, and with cooperative inter-agency systems development.

DDC's referral service extends the scope of its technical report program to include the acquisition, storage and retrieval of information concerning DOD-sponsored specialized sources of scientific and technical information. When authorized users require information exceeding that contained in technical reports, this service is used to direct them to organizations or to individuals who are known or potential sources of this expertise, or to the National Referral Center for Science and Technology of the Library of Congress.

Other services related to the technical report program include the maintenance and continuous development of the DOD "Thesaurus of Engineering and Scientific Terms," and the primary distribution within the United States of certain foreign technical reports.

DDC offers registered user organizations an extended library reference service on some 850,000 technical documents, and computer facilities to quickly retrieve relevant information required in support of the DOD research and development effort.

The DDC services described in this article can save valuable research time and talent for organizations involved in Federally sponsored projects. Personnel at the center are ready and eager to lend assistance in these research and development programs. For additional information concerning DDC services, write to the:

Defense Documentation Center
Attn: DDC-L
Cameron Station.
Alexandria, Va. 22314

Growth of DDC Services

Research and Technology Work Unit Information System

Work Unit Input	FY 1966	FY 1967
New Records	18,584	12,805
Changes	11,106	24,422
Requests for Data—Output	924	3,194

Technical Report Program

Document Announcements		Document Requests		Bibliography Requests	
Fiscal Year	Announcements	Fiscal Year	Requests	Fiscal Year	Requests
1953	7,568	1953	198,188	1959	1,826
1954	13,729	1954	209,801	1960	1,890
1955	26,720	1955	295,814	1961	3,735
1956	34,399	1956	383,647	1962	4,166
1957	21,015	1957	454,000	1963	5,953
1958	18,657	1958	322,000	1964	7,603
1959	31,076	1959	395,058	1965	10,079
1960	30,061	1960	547,993	1966	17,496
1961	26,443	1961	700,100	1967	20,433
1962	23,897	1962	827,876		
1963	30,613	1963	1,026,834	An average of 128 citations were included in the 20,433 bibliographies prepared for DDC user organizations in FY 1967.	
1964	44,919	1964	1,171,259		
1965	*50,603	1965	1,486,382		
1966	47,891	1966	1,506,996		
1967	50,140	1967	1,846,240		

*Excludes 8,635 documents announced in supplements to TAB 64-5.

The average RDT&E document in the DDC collection is between 60 and 70 pages.

The Audit Role in Value Engineering

Frank Romeo

Herbert B. Goodwin

The audit function serves a key role in the financial administration of the DOD Value Engineering (VE) Program. The services of the auditor are used most commonly in two major areas of value engineering activity. The first area concerns Value Engineering Change Proposals (VECPs), submitted by contractors in support of an amount to be negotiated as their share of savings resulting from a contract change which they have proposed. The second involves the validation of value engineering savings claimed under the Defense Department Cost Reduction Program. This article addresses the audit and financial aspects, and some of the problems which characterize each of these two areas.

The first part of this discussion deals with the initial area described, namely, value engineering changes under those contracts which authorize contractor sharing in the resultant savings.

Two Classes of Changes

These changes are known as Class I value engineering changes, not to be confused with Class II changes. The distinction between these two classes of changes is significant.

Class I changes are those whose implementation require an amendment to the contract. They may involve a revision in a contract specification, purchase description, or statement of work. They may include either the elimination or modification of any requirements found to be in excess of actual needs, in such areas as design, components, packaging requirements, testing procedures, and the like. Class II actions, on the other hand, are those changes whose implementation do not require an amendment to the contract. The contracting officer is the only one authorized to make the

final determination as to whether a contract requires amendment as a result of a proposed value engineering change.

Most defense contracts awarded in the past few years contain value engineering clauses as specified by Defense Procurement Circular (DPC) No. 11, Oct. 9, 1964. This basic document provides for two types of value engineering motivations: value engineering program requirement clauses and value engineering incentive clauses. The basic difference between these clauses can be summarized as follows: the program requirement clause requires the contractor to perform value engineering at a certain level of effort which is specified as a line item or part of a line item in the contract; under an incentive clause, it is optional with the contractor as to whether he will expend value engineering effort under the contract.

However, both types of clauses provide for contractor sharing, in most cases, in the following types of savings resulting from value engineering:

- Instant Savings, to be realized on the contract under which the contractor submitted his successful VECP.

- Future Acquisition Savings, computed on the basis of future procurement by the Government, during a specified period of time, of the item, component, or system which incorporates the value engineering change.

- Collateral Savings, based on the net reduction in anticipated government costs, as a result of the value engineering change. These government costs include operations, maintenance, logistic support, and government furnished property.

The recently issued Armed Services Procurement Regulation (ASPR) Revision No. 28 (ASPR Section I, Part 17) rescinded DPC No. 11. While the

primary effect of the rescission was to incorporate the DPC into the ASPR, certain changes were made. These differences between the ASPR and the DPC are significant because they have direct impact on either the allowability of value engineering cost incurrence, or the computation of the amount of savings which the Government and the contractor will share.

ASPR Revision No. 23

The first difference to be discussed concerns the area of cost allowability. The essence of the change is the greater precision in definition of allowable cost which is found in Revision 23. Quotation of pertinent passages from the DPC and Revision 23 will illustrate this point. DPC No. 11 stated:

Cost allowability will be determined in accordance with normal application of the principles and procedures provided in Section XV. Accordingly, where a contractor already has a value engineering program, the Government will bear a reasonable and allocable share of the cost of this program, but inordinate value engineering cost increases incurred solely because of inclusion of the clause shall not be allowed. Similarly, where a contractor does not have a value engineering program in existence, proper allocable costs of instituting a reasonable value engineering program are allowable.

However, Revision No. 23 is more specific. It provides that:

Value Engineering shall not be allowed as a direct charge against cost-type contracts containing the Incentive clause, and shall be allowed as a direct charge against cost-type contracts containing the

program requirement clause only to the extent proper to cover the required Value Engineering Program. In either case, the cost of the value engineering is an allowable indirect charge to the extent that, under Section XV, it is reasonable in the conduct of the contractor's business as a whole and allocable to the particular contract.

As far as fixed-price contracts are concerned, Revision 23 provides that "the normal price negotiation policies and techniques in Section III, Part 8, shall be followed in determining whether or to what extent the cost of value engineering may be included in the contract price."

Another significant change between the DPC and the ASPR revision concerns contractor reimbursement for development costs he incurred in connection with successful value engineering proposals. The DPC was silent on this point. However, Revision 23 provides that those contractor costs incurred in developing the value engineering proposal shall be deducted from the total estimated cost savings if these development costs:

- Are proper direct charges of the contract involved.
- Are not otherwise reimbursable under the contract.

The ASPR revision also provides a basis for the identification of development costs in that it specifies that they are normally those costs which have been incurred by the contractor after he has identified a specific value engineering project.

Under both DPC 11 and Revision 23, implementation costs in most cases must be deducted from gross savings in order to arrive at net savings eligible for sharing. While DPC 11 did not define implementation costs, Revision 23 is more specific. It establishes implementation costs as those cost of incorporating a change which are incurred by a contractor after the value engineering proposal has been accepted by the Government.

It can be appreciated that the differences just discussed can have a rather significant impact on the contractor's picture in the value engineering area.

Key Factors in Financial Administration

At this juncture certain observations are in order. The points involved represent some of the key factors which must be reckoned with in the financial administration of the value engineering program.

The difference between Class I and Class II changes has been mentioned and examples of typical Class I changes were offered. However it is not always easy to determine whether a change should be classified as Class I or Class II. However, difficult as the determination may be, the financial impact for both the Government and the contractor can be considerable under a firm-fixed-price contract. If it is decided that the change is a Class I type, the contractor would have to share the savings with the Government. If however the decision is that the change is Class II in nature, the contractor could then retain the full amount of the savings.

DOD personnel, who are responsible for determining whether or not a VECP should be referred for audit in support of negotiation, are not unduly influenced by the amount of instant savings claimed. It is the experience of the Defense Contract Audit Agency, which is the DOD component responsible for audit of this type of contractor proposal, that while instant savings may be nominal, *i.e.*, substantially under \$100,000, future acquisition savings can be, and often are, significant.

The time frame for purposes of determining future acquisition savings ranges up to three years. As can easily be seen, a heavy volume of procurement of the value engineered item during this period could result in considerable savings to be shared. To summarize, along with other pertinent factors, the amount of future acquisition, as well as instant savings, is considered in deciding whether the audit route should be taken.

From an estimating point of view, a VECP is substantially the same as any other proposed change to a contract price or, for that matter, an initial price proposal. Any determination of the savings that will accrue from a value engineering change will be no more valid than the estimating techniques used in

computing such savings. Procedures have been established for notification to contracting officers in those cases where contractor estimating practices are not considered adequate.

However, it is a fact of life that corrective action is not accomplished overnight. Where minimum reliance can be placed on a contractor's estimating procedure, attention is invited to ASPR Section 1-1704.2. This ASPR section provides for a reduced sharing arrangement in a fixed-price contract not awarded on the basis of competition and, in an incentive type contract, for a share arrangement in accordance with the cost incentive sharing rate of the contract. Implementing this provision under an incentive contract would preclude a contractor from obtaining any advantage in the event that his estimate of savings were faulty; in effect, did not materialize. The resulting overrun would reduce the contractor's profit to what it was prior to amendment for the value engineering change.

Identification of Effort

So much for observations. At this point, it would be appropriate to consider certain subjects that represent problems from the audit point of view.

There is a strong similarity in the nature of contractor effort devoted to value engineering, product improvement, development and/or design activity. In many cases, the same personnel may be used interchangeably in any or all of these areas. The engineering discipline applicable to each of these activities is similar. The problem, then, is how to identify value engineering effort to the exclusion of similar types of effort; particularly where the contractor is or has been funded for these other types of activity under separate contractual arrangement. In order to properly identify an activity, it must be possible to associate it with a specific work objective.

Perhaps the best statement of a work objective for value engineering can be found in Revision 23 which states: "Value Engineering constitutes a systematic and creative effort, not required by any other provision of the contract, directed toward analyzing each contract item or task to assure that its essential function is provided at the lowest overall

cost." In other words, value engineering is an organized effort, specifically directed toward cost reduction. Savings resulting from this effort are not incidental or happenstance to some other program or effort of the contractor.

Once a work objective has been established, specific project or work order identification should be assigned. This identification then enables a contractor to accumulate, as an entity, the cost of the effort associated with a particular work objective, whether it be value engineering, product improvement, or development. Value engineering costs should be separately accumulated and identified, regardless of whether the contractor subsequently charges them to overhead or direct to a contract.

Unfortunately, many contractors do not adequately identify their work objectives. Value engineering costs are variously charged to engineering overhead, design, testing and like functions, losing their identity in the process. As a result, a certain confusion is encountered in the financial phase of a contractor's value engineering program. This is particularly evident when a value engineering change is submitted under a contract with a maximum share ratio, although developed under another contract with a substantially lower share ratio. Also, cases have been noted where, although a contractor is or has been fully funded by the Government for product improvement effort, the results of this effort are often erroneously submitted as a value engineering change under an unrelated contract.

Admittedly, the distinction between product improvement and value engineering may sometimes be difficult to draw. Approaching this distinction from the negative point of view, however, may be helpful. Value engineering does not result in a change of required function or performance. To illustrate, the cover for an electronic circuit is too expensive because it was designed in a hurry with the result it was made largely by hand. Product improvement would improve the design and seek better material and more efficient processes to build it. Value engineering, by contrast, would define the required function of the cover and then seek alternative ways

of providing this function, perhaps even eliminating the cover.

Where contracts provide for product improvement or where there are concurrent contracts providing for product improvement, and it is desirable to further motivate the contractor to a value engineering effort, there should be a clear and definite understanding as to which areas are subject to product improvement, and which to value engineering. Otherwise, there is a real problem potential in identifying effort with the objective to which it applies. This, of course, is significant in terms of the ultimate cost to the Government and the savings in which the contractor shall share.

Before leaving this subject of identification of effort, note should be taken of an area that seems to be particularly susceptible to confusion: design engineering effort of a funded nature is easily confused with effort rewardable under a value engineering incentive or program arrangement. Where both design and value engineering effort are authorized under the same contract, to differentiate between the two types of activity it is common to consider any change effected prior to the government authentication of the original design as effort funded under the contract, and not eligible for a value engineering reward.

Implementation Costs

A problem often develops in determining the type of activity whose cost is proper for inclusion in the broad category of implementation costs. In most cases, the savings eligible for sharing must be reduced by these implementation costs. As indicated previously, implementation costs are those costs of incorporating a change which are incurred by a contractor after the value engineering proposal has been accepted by the Government. Although this definition seems fairly specific, there have been varying interpretations. To the auditor, however, implementation costs include the following types of expense, where applicable:

- The cost of parts, already in inventory, that will be rendered obsolete as a result of the change.
- The cost of disposing of these parts.

- Those expenses which are involved in getting the change into production, such as production engineering design; fabrication, installation and maintenance of new tools and equipment; training of personnel; expenses for the labor to install or rearrange production and/or test equipment; and product design and test engineering work to alter existing product drawings, diagrams and test specifications.

- The cost of preparation and publication of changes to operating, maintenance and supply manuals.

Another area that causes concern is the choice of the base cost to be used in computing the gross savings which will result from the value engineering change. This choice becomes significant in those cases where there is an appreciable difference between the negotiated and the actual cost of the item or process being eliminated.

To illustrate the point, assume that an assembly is being replaced as a result of value engineering. Further, assume that the negotiated value of this assembly, as incorporated in the contract price, was \$1,000; that the actual cost of fabricating this assembly was \$1,300; and the cost of replacement will be \$700.



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The contractor computes the savings as \$600, the actual cost of \$1,300 less the replacement cost of \$700. The auditor computes the savings as \$300, the negotiated value of \$1,000 less the replacement cost of \$700. We have here a substantial difference in the amount of the savings, depending upon whether negotiated or actual cost is used as the base.

If the contractor's rationale prevailed, conceivably he could obtain a greater reward for an inefficiency that caused him to substantially exceed his original anticipated cost for the assembly. Conversely, had the contractor been successful in producing the assembly for less than the negotiated value, the auditor's procedure would result in a greater reward than would the contractor's, justifiable perhaps on the basis that the indicated production efficiency entitles the contractor to this greater share in savings.

While there was no problem in coming up with negotiated and actual cost figures in the example just discussed, figures are not always that easy to develop in the real situation; many times resort must be made to estimates of both negotiated and actual cost. However, where there is reason to suspect a significant dif-

ference between negotiated and actual costs, the principles just discussed are recommended for utilization by DOD personnel in the proposal negotiation.

Validation of Savings

Now we turn to the other major audit effort associated with the value engineering program, namely, validation of value engineering savings reported to the Cost Reduction Program.

It is interesting to note that the audit work involved in validation of cost reductions involves some of the same problems as VECP audits. It is far from simple to distinguish value engineering from other functions which are similar, and to price out the benefits of value engineering projects. However, prior to any discussion of how claimed value engineering savings are audited in the Defense Department Cost Reduction Program, it is appropriate to review some of the more important provisions of the reporting instruction (DOD Instruction 7720.6) which was revised in May 1967.

From an audit viewpoint, the revised instruction made some important criteria changes in the value engineering area. These changes clarify some of the provisions which used to create disputes between auditors and program monitors. One example is the scope of the area which has been redefined. The old instruction seemed to limit the scope of the value engineering area to the elimination of unessential technical requirements for systems, facilities, equipment and materiel. Now the scope is defined as a systematic effort directed at analyzing any function, for the purpose of achieving the function at the lowest cost consistent with the requirements for performance and reliability. Another change in the instruction is the provision that there must be a written value engineering proposal before an action may be reported in the value engineering area. This was not a requirement in the old instruction, and there were many arguments as to whether or not certain cited actions represented reportable value engineering in the program.

Another new rule is that savings on contracts, which result from unilateral Class II changes, may be re-

ported only when the savings result directly from a value engineering program on a specific contract which is funded as a separate line item in that contract. As is generally recognized, there were many problems in the past regarding the eligibility of Class II changes. While this new provision may not eliminate all the problems, it undoubtedly will reduce their number.

Also, the new instruction now spells out the prescribed time for reporting value engineering savings. The special guidance for the value engineering area includes detailed instructions for both in-house savings and savings on contracts with others. Briefly, the new provisions are that, for items produced or services performed in-house, the savings are reportable when the value engineering proposal has been approved and implemented; savings on existing government contracts normally will be reported when the value engineering proposals have been approved, and the contractor is notified to implement the proposals. If the value engineering action affects an item or services procured after final approval of the value engineering proposal, the action will be reportable in the year the procurement contract is awarded.

The Cost Reduction Audit

So much for the revised instruction. Now the methods employed in validating the savings can be discussed. Like most other types of audits, the cost reduction audit is made on a selective basis. This means that the auditors do not make a detailed audit of all savings actions. To do so would be impractical, if not impossible, because many thousands of savings are reported each year. These range from very small to very large savings. To obtain the desired confidence level, all large savings (over a prescribed dollar amount) are audited in enough detail to substantiate their eligibility and amount. A limited number of smaller savings, in dollar amounts below the prescribed threshold, also are audited in some detail. These savings are first desk-reviewed, and those which clearly fail to meet program criteria are rejected. Of those which seem to qualify, a small number are picked for further audit examination, and



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the others are accepted without further audit. If the detailed audit of the selected savings shows faulty procedures or incorrect reporting, the size of the sample is increased. The foregoing audit scope takes in the bulk of the total dollars reported, and provides an adequate basis for an audit opinion on the overall reliability of the cost reduction system and the reasonableness of total savings reported.

The results of the Cost Reduction Program are widely publicized, both within and outside of the Defense Department. Therefore, it is essential that claimed savings be defensible. If not, the results could be very embarrassing to DOD and its officials. To guard against such an event, only audited cost reduction reports are submitted to the Secretary of Defense. To make sure that the audits are timely, a very high audit priority has been assigned to the Cost Reduction Program. The audit is performed on a continuous basis so that the review is completed by the time the cost reduction reports of accomplishments are issued.

The audit organizations of the Military Departments and the Defense Agencies perform their respective audits. This work is done under detailed guidance issued by the heads of each audit office, and is specifically tailored to the needs of each DOD component. Overall policy guidance is furnished by the Assistant Secretary of Defense (Comptroller) in DOD Instruction 7600.14. The consolidated DOD Cost Reduction Reports, issued by the Office of the Assistant Secretary of Defense (Installations and Logistics), are reviewed by the Office of the Deputy Comptroller for Audit Systems which is a part of the Office of Assistant Secretary of Defense (Comptroller). For all practical intents and purposes, complete reliance is placed on the auditing done within the DOD components; however, the Office of the Deputy Comptroller for Audit Systems does review some of the larger or more sensitive looking items, and occasionally reviews actions which are in dispute between the program monitors and the auditors of the DOD components.

Naturally, there may be some differences in the details of the audit in-

structions issued by the DOD audit organizations. However, the general approach to the audit is the same. Field auditors review individual savings claims at the levels where the actions are taken. Where it is necessary to examine the records of a defense contractor, the Defense Contract Audit Agency performs an assist audit.

As individual savings reports are forwarded through command reporting channels and included in report consolidations, the larger savings are desk-reviewed by supervisors who also review the consolidated reports. Finally, the cost reduction project auditors of the DOD component headquarters review the overall departmental consolidation. There have been some complaints about the number of higher echelon audit reviews. However, they are needed to insure uniformity within a DOD component in the auditor's interpretation of program criteria and audit guidance. Incidentally, the reviews at higher levels do not necessarily result in rejecting savings which were validated at lower levels. They often result in accepting savings which were non-validated at lower echelons.

One point that should be made is that a great deal of judgment is involved in this audit, not only in determining whether an action meets program criteria but also in assessing the adequacy of supporting documentation. Obviously, it would be undesirable to create new, elaborate systems and documentation just for cost reduction purposes. Accordingly, auditors are required to consider the intent of the program, to be objective in interpreting program criteria, and to be realistic in their requirements for supporting documentation. Where a saving results from a conscious management action that appears to meet the objective of the program, it generally will be accepted by the auditors even though it could be questioned on the basis of some technicality. However, if the calculation of the saving involves estimates, it is expected to be on the conservative side. On the other hand, the auditors must be assured that the savings are supportable and will stand up under outside, critical review. Therefore, if funds are saved by happen-

stance and the savings cannot be shown to be the result of a new, improved, or intensified management action, the auditor will reject the claim.

Many may wonder about the necessity for having auditors police the reporting of program accomplishments. From the very beginning, Secretary McNamara insisted on an independent audit, and assigned the responsibility to the Assistant Secretary of Defense (Comptroller). As indicated in the last report to the President, Secretary McNamara also arranged for the General Accounting Office to review the program. Obviously, this adds to our incentives to report only good savings which qualify under the rules of the program.

No matter how good the preliminary screening becomes, this program does invite differences of opinion. Since situations are hardly ever clearly black or white, it would be surprising indeed if the auditors were never found guilty of turning down savings which the program monitor is convinced are valid. If this should happen, it is well to remember that the auditor is not the final judge and jury. There is a clearly defined procedure for submitting disputed actions for review. This procedure is described in DOD Instruction 7720.6. Where program monitors are convinced that a saving is valid but cannot get audit acceptance at their level, the disputed action is referred to the next higher level of command—all the way up to the Departmental Secretary or Agency Director, if necessary. Where differences cannot be resolved even at the highest level of a DOD component, the cases will be referred to the Office of the Secretary of Defense for resolution.

As may be seen from this description, the DOD Cost Reduction Program has received a great deal of audit emphasis. Undoubtedly, there are cases in which those responsible for meeting savings goals are disappointed because one of their savings is declared ineligible for reporting. However, all responsible program managers are convinced that a strong, independent audit is essential to the effectiveness and credibility of the program.

SecDef Reports Defense Industry Support of Cost Reduction Program

[Editor's Note: The following is a memorandum dated Dec. 22, 1967, addressed to President Lyndon B. Johnson by former Secretary of Defense McNamara, reporting on the Defense Contractor Cost Reduction Program.]

It is now four years since you requested defense contractors to assist in reducing defense expenditures by expanding and intensifying their cost reduction efforts on defense business. The voluntary Defense Contractor Cost Reduction Program was formalized three and one-half years ago to provide a channel for communicating the results of these intensified efforts. The achievements reported since then by these contractors demonstrate clearly that defense industry has given unqualified and continuing support to your stated objective. Cost reduction and management improvement have become a permanent way of life with a major segment of the defense industry community.

Reporting Companies

Today 85 parent companies [listed on page 18] are active participants in the Defense Contractor Cost Reduction Program—an increase of 13 percent over FY 1966. They have 211 plants or divisions (an increase of 15 percent) which report to us semi-annually. In FY 1967, these companies received more than half of the \$39.8 billion awarded by the Defense Department to business firms for work in the United States.

Savings to Defense

Participating contractors report to us the savings they have effected by reducing costs, without sacrifice of requisite quality and reliability. These savings result from improved management techniques, procedures, or processes. Savings reported relate to defense sales, exclusive of firm fixed-price contracts. In the year ending June 30, 1967, participating contractors reported savings of \$972 million on these defense sales, which

totaled \$12.4 billion. In the two prior years of formalized reporting, they reported \$1.8 billion in savings for a three-year total of over \$2.7 billion. These are direct savings to the Defense Department, since they represent the elimination of costs which otherwise would have been reimbursed.

Benefits to Industry

In addition to contributing to your national objective of "a dollar's value for every dollar spent," defense industry considers cost reduction to be in its own best interest. The increased emphasis by the Defense Department on the use of incentive-type contracts, competitive procurement and the application of value engineering techniques encourages defense industry to stress cost reduction and management improvement.

The trend of the late fifties and very early sixties towards greater use of cost-plus-fixed-fee contracts by the Defense Department has been sharply reversed over the past six years. This type of contract, which is usually justified only when there are great uncertainties involved, offers neither reward for good performance nor penalty for bad. The proportion of cost-plus-fixed-fee contracts awarded by the Defense Department has been reduced from a high of 38 percent in FY 1961 to 10.4 percent at the end of FY 1967.

During the same period of time, the percentage of total procurement dollars awarded on a price competitive basis by the Defense Department increased from 32.9 percent to 42.9 percent.

North American Rockwell Corp., in its latest annual report to stockholders, discussed today's defense contracting environment:

While the combined volume of business in these two fields of defense and space continues to be high, we are also entering a period of new opportunities for greater returns on this business. In the current trend

away from cost-plus-fixed-fee contracts, almost all North American's work in the 1967 fiscal year will be under fixed-price or incentive-type contracts. These involve both higher risks and the possibility of higher returns.

The Defense Department has also increased financial incentives to encourage defense contractors to seize every opportunity to eliminate non-essential design and performance features through value engineering. Recent departmental regulations have improved these contractual incentives by:

- Expanding the opportunities for a contractor to earn a greater share of his value engineering savings—in some cases to over 50 percent.
- Sharing the costs of developing a value engineering change proposal with the contractor where appropriate.
- Shortening the time a contractor must wait for payment of his share of the savings.

In addition to the incentives being offered by the Defense Department, corporate executives are motivated because they consider an effective cost reduction program essential to stay competitive and earn reasonable profits. A successful program also enables top management to demonstrate its cost consciousness to stockholders, customers and the general public.

Curtiss-Wright Corp. summarized the benefits from its broad management improvement programs in its latest report to stockholders:

These programs have consolidated functions and operations, reduced costs, increased efficiency, rechanneled our capabilities, and materially strengthened the competitive position of Curtiss-Wright.

In its most recent annual report, Lockheed Aircraft Corp. discussed cost reduction techniques, as well as benefits:

The third year of the intensified cost reduction campaign sponsored by the government in defense and space industries once again showed improvement . . . Savings are shared with the government and are used to strengthen our competitive position. They result from improved management techniques, computer aids, automation, process innovation, value engineering, and the Zero Defects quality improvement program.

Examples

Following are examples of savings reported by contractors during the year ending June 30, 1967:

Bell Aerospace Corp.

Bell Helicopter Co. eliminated fuel lines and jettison cables for auxiliary fuel tanks as "built-in" equipment on the UH-1D helicopter. This change resulted from a value engineering analysis which disclosed that the auxiliary fuel tanks were used only for ferrying operations. The desired ferry capability was obtained by including these lines and cables in a relatively small number of auxiliary fuel tank modification kits. Elimination of this equipment from production aircraft saved the Army \$97,047. In addition, the action significantly reduced aircraft weight.

General Electric Co.

General Electric's Defense Electronics Division is now providing new-type 25,000-hour miniature indicator lamps as replacements for 7,000-hour lamps in the display panels aboard Polaris fleet ballistic missile submarines. Use of the new lamps in the display panels of the 41-ship Polaris-Poseidon weapon system will mean 1,760 fewer lamp replacements per submarine per year. One-year savings to the Navy on current supply contracts totaled \$19,321. The Navy will realize even greater benefits in reduced fleet operational maintenance.

Goodyear Aerospace Corp.

Goodyear recommended substituting special-purpose photographic units costing \$8,804 each for units costing \$20,263 each which were originally specified in an Air Force contract for mobile photographic

facilities. Joint evaluation of the two units by Goodyear and the Air Force revealed that the lower-cost unit was equal to, and in some features superior to, the more expensive one in performance and design. This change saved the Air Force \$586,591.

Lockheed Aircraft Corp.

Lockheed Missiles and Space Co. changed from a lease arrangement with the manufacturer to an installment purchase contract for a digital computer, as a result of an analysis of all company computer costs. Savings totaled \$206,202.

North American Rockwell Corp.

Autonetics Division centralized the shipping functions of its three product divisions on the basis of a systems and facility study. Operating costs were reduced \$327,800 by consolidating shipments, improving manpower utilization, and reducing material requirements.

Olin Mathieson Chemical Corp.

The Indiana Army Ammunition Plant mechanized a propellant load line used in the production of the Charge M67 for the 105mm gun. Fully amortized equipment on hand from a previous operation was modified and combined with new equipment for the mechanized operation. Savings to the Army over the prior manual operation totaled \$770,408.

Philco-Ford Corp.

Philco-Ford's Aeronutronics Division replaced an aluminum sand casting used in the Shillelagh missile flight control housing with a less expensive permanent mold casting and saved \$698,243. The division also substituted a metal film resistor for a more expensive but less reliable wire bound resistor in the missile's control assembly and saved an additional \$108,793.

Raytheon Co.

Raytheon substituted molded plastic assemblies for individually machined steel assemblies used in the production of the M905 bomb fuze. The saving on 1,400,000 fuzes was \$232,500.

Remington Arms Co., Inc.

The Lake City Army Ammunition Plant reduced the size of the carton for the 5.56mm M193 ball and

M196 tracer cartridge and eliminated a tray previously specified for use with the carton. As a result, each packing box now holds 41 cartons (820 cartridges) instead of 36 cartons (720 cartridges). Reduced material costs for the cartons and reduced requirements for packing boxes and crates saved \$414,833.

Joint Defense-Industry Workshops

During February-April 1967, a series of joint Defense-Industry regional workshops was held to discuss mutual problems and interests concerning the Defense Contractor Cost Reduction Program. Over 1,000 industry and Defense Department representatives attended. At these meetings, working level cost reduction personnel from both industry and the Defense Department were brought face-to-face. Panel meetings at each workshop examined selected areas in depth. A specific conclusion was that the Contractor Program Guidelines issued in May 1964 are still working well.

The Board Chairman of one of the largest defense contractors, in a letter to the Defense Department, stated:

In further regard to the subject of motivation, we feel that the recent Defense-Industry Joint Regional Cost Reduction Workshops contributed significantly to even better working relations between DoD and the contractors, and to a more complete understanding of mutual problems and objectives.

We agree and plan to schedule joint Defense-Industry cost reduction meetings annually.

Future of the Program

I believe the record of the voluntary participants in the Defense Contractor Cost Reduction Program is clear evidence of the defense industry's accomplishments and sustained interest in support of our objective of conserving defense resources.

You may be sure that we in the Defense Department will continue to work closely with our defense contractors to capitalize on every opportunity for increased economy in Government.

**Alphabetical Listing of Parent
Companies Participating in Defense
Contractor Cost Reduction Program**

AAI Corp.
Aerojet-General Corp.
American Air Filter Co. Inc.
American Bosch Arma Corp.
ARO, Inc.
Atlantic Research Corp.
Atlas Chemical Industries, Inc.
Avco Corp.
Beech Aircraft Corp.
Bell Aerospace Corp.
Bendix Corp.
Boeing Co.
Burroughs Corp.
Collins Radio Co.
Computing and Software, Inc.
Continental Aviation and Engineering Corp.
Control Data Corp.
Cornell Aeronautical Laboratory, Inc.
Curtiss-Wright Corp.
Day and Zimmermann, Inc.
Dynalectron Corp.
Electronic Communications, Inc.
Electro-Optical Systems, Inc.
Fairchild Camera and Instrument Corp.
Federal Cartridge Corp.
FMC Corp.
Garrett Corp.
General Dynamics Corp.
General Electric Co.
General Motors Corp.
General Precision Inc.
Goodyear Aerospace Corp.
Grumman Aircraft Engineering Corp.
Gyrodyne Co. of America, Inc.
Harvey Aluminum Sales, Inc.
Hayes International Corp.
Hercules, Inc.
Holston Defense Corp.
Honeywell, Inc.
HRB-Singer, Inc.
Hughes Aircraft Co.
Hycon Manufacturing Co.
International Business Machines Corp.
International Harvester Co.
International Telephone and Telegraph Corp.
Interstate Electronics Corp.
Johns Hopkins University
Lear Siegler, Inc.
Kaiser Jeep Corp.
Ling-Temco-Vought, Inc.
Litton Systems, Inc.
Lockheed Aircraft Corp.
Loral Corp.
Magnavox Co.
Marquardt Corp.
Martin Marietta Corp.
Mason and Hanger—Silas Mason Company, Inc.
Massachusetts Institute of Technology
Maxson Electronics Corp.
McDonnell Douglas Corp.
Melpar, Inc.
Mitre Corp.
Motorola Inc.
Newport News Shipbuilding and Dry Dock Co.
North American Rockwell Corp.
Northrop Corp.
Olin Mathieson Chemical Corp.
Page Aircraft Maintenance, Inc.
Pan American World Airways, Inc.
Phileo-Ford Corp.
Radiation, Inc.
Radio Corp. of America
Raytheon Co.
Remington Arms Co., Inc.
Ryan Aeronautical Co.
Sperry Rand Corp.
Sylvania Electric Products, Inc.
Thiokol Chemical Corp.
TRW, Inc.
UNIROYAL, Inc.
United Aircraft Corp.
Vitro Corp. of America
Western Electric Co., Inc.
Westinghouse Electric Corp.
Whittaker Corp.

**Annual Symposium
of IEEE Scheduled
for May 6 and 7**

"Human Factors in Electronics" will be the theme of a two-day symposium and exposition to be sponsored by the Man-Machine Systems Group, Institute of Electrical and Electronics Engineers, on May 6 and 7 at the Marriott Twin Bridges Motor Hotel in Washington, D.C.

The symposium will include four technical sessions, four panel discussions and two luncheons.

The program will feature discussions and displays dealing with human factors in Government, aircraft cockpit displays, perception and response, systems analysis and modeling, man machine control systems, aviation and space applications, and use of simulators in traffic safety.

Attendance at the sessions and exposition is encouraged from agencies of the Federal Government, the Military Departments and research firms. No registration fee will be charged for attendance at the exposition.

For further information contact Rube Chernikoff, General Chairman, Department of Transportation, 412-B Donohoe Building, Washington, D.C. 20591, Phone (202) 962-8337.

**Advanced Ballistic
Missile Defense Agency
Established**

The Army will establish an Advanced Ballistic Missile Defense Agency, which will combine some elements of the Defense Department's Advanced Research Projects Agency (ARPA) Office of Ballistic Missile Defense and advanced development of the Nike-X.

Dr. Patrick J. Friel, current Director of ARPA's Office of Ballistic Missile Defense, will be appointed as Deputy Assistant Secretary of the Army and will serve as Director of the Advanced Ballistic Missile Defense Agency.

ARPA will continue to pursue research and studies in the area of advanced strategic technology. Dr. David E. Mann will direct the activities of the ARPA office.

Standardization of Components/Equipment in the Naval Material Command

Harry Dickinson

Effective fleet operations hinge on the readiness and performance of equipment, as well as on the men who man it. Ship commanders have made the Washington level acutely aware of problems stemming from a lack of hardware standardization. Typical is an excerpt from a letter received from the Fleet: "The lack of standardization causes a multitude of problems to the type commanders. Already 30 percent of the hull, mechanical and electrical allowance parts apply to only one ship. Logistic support is more expensive, repair parts are prolonged (receipt-wise), libraries, instruction books and drawings expand, the training of shipboard and yard personnel is complicated."

Reliability and maintainability have been stressed in hardware design and acquisition, and to a lesser degree so has supportability—the ability to acquire and provide repair parts in the right quantity in time to meet demand. The wider and more diverse the range of equipment in use, the more costly and difficult is repair part support. This theme is axiomatic and the operational level consistently voices it.

With recognition of the need for improvement in the acquisition and management of hardware, in May 1966 the Navy's bureau structure was revamped. This was marked by changes so deep that they required the term "material bureau" be discarded. To spread the acquisition and management of naval material more evenly, four bureaus were replaced by six systems commands:

Naval Air Systems Command
(NAVAIR)
Main Navy Building
Washington, D. C. 20360

Naval Electronics Systems
Command (NAVELEX)
Munitions Building
Washington, D. C. 20390

Naval Facilities Engineering
Command (NAVFAC)
Yards and Docks Annex
Washington, D. C. 20390

Naval Ordnance Systems
Command (NAVORD)
Munitions Building
Washington, D. C. 20390

Naval Ship Systems
Command (NAVSHIPS)
Main Navy Building
Washington, D. C. 20360

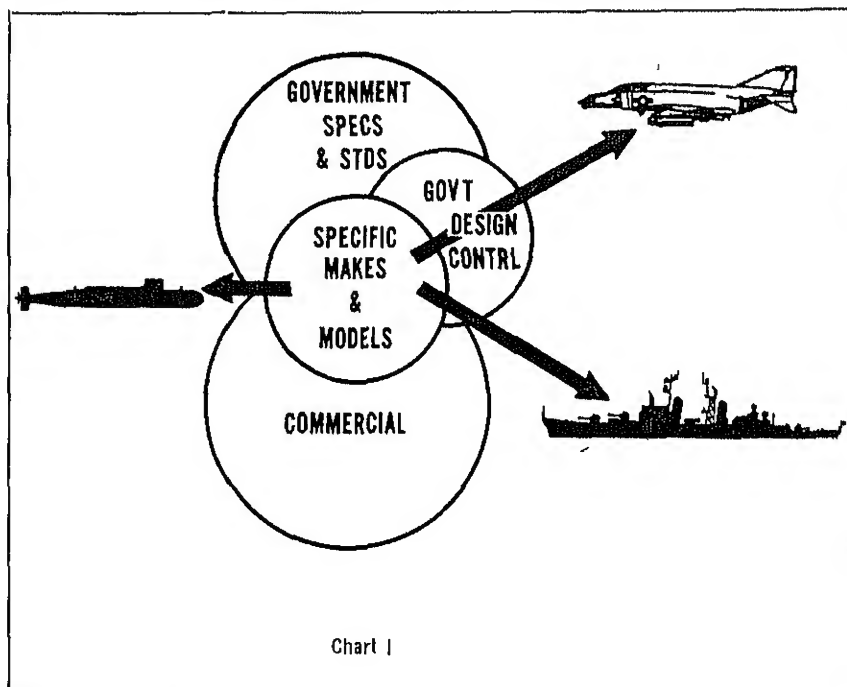
Naval Supply Systems
Command (NAVSUP)
Main Navy Building
Washington, D. C. 20360

Concurrent with the reorganization, and consonant with the theme of improving logistic support, the Chief of Naval Material established a permanent staff for component/equipment standardization and configuration management reporting directly to the Deputy Chief of Naval

Material (Logistic Support), formerly Rear Admiral J. D. Arnold, now Rear Admiral Nathan Sonenshein. This staff operates under the direction of Captain W. Seith, USN.

The profound interrelation of standardization and configuration management is worthy of note. Configuration management (see article, "Configuration Management in the Navy," *Defense Industry Bulletin*, Volume 3, No. 4, April 1967, page 4), through its requirements for configuration control, accounting and identification, reinforces the controls that maintain both standardization and the identification necessary for programming retrofit of standard items into non-standard installations.

The backdrop for promoting greater standardization included findings of various studies and reports developed by the Logistics Management Institute (LMI) as well as internally by the Navy. The findings



emphasized the equipment proliferation problems being encountered in the Fleet. This proliferation, or multiplicity of makes and models of components/equipments used to serve the same purpose—functionally the same, but having different internal parts, was attributed to a lack of standardization in design and procurement. Components/equipments, as referred to herein and defined under the scope of the Navy's program, are repairable items requiring repair part support.

Concrete evidence exists on the scope of the proliferation. For example, Navy's Allowance Parts Lists (APLs), listings of distinct repair parts for the different hull, mechanical, electrical components/equipments supported in the active Fleet, include 40,000 different sizes, types, varieties and kinds of valves. The quantity of valves, which supports the approximately 1,100 ships in the Fleet, is actually a multiple of the total number of different types of commercial valves available from industry. Valves represent an area to be subjected to early standardization treatment. There are many other commodities covered by APLs. Approximately 159,000 different components/equipments are currently required for fleet support, serving in the neighborhood of two million applications within the previously mentioned 1,100 hulls. These population

data for shipboard components/equipments are registered in the files of the Ships Parts Control Center (SPCC), Mechanicsburg, Pa., the inventory control point for hull, mechanical, electrical items.

Government specifications and standards (see Chart 1) as a rule do not specify internal parts interchangeability but provide for form/fit function requirements. Government design control data packages generally provide for parts interchangeability; however, there are exceptions—mainly in the electronics area where the packages cite circuit symbol data which do not necessarily provide parts interchangeability. As discussed later in this article, NAVEX is surveying standardization requirements for electronics. The vast universe of commercial equipment available also tends to mitigate against parts interchangeability.

The program for component/equipment standardization is working toward controlling the multiplicity of makes and models in and entering the Fleet. The tendency shall be an orderly orientation toward specific makes and models which have proven reliability and are supportable with a depth of repair parts.

The Navy has developed policy which has been issued from the Chief of Naval Operations level and promulgated throughout the Naval Material

Command by the Chief of Naval Material. This policy, stated broadly, requires that the hardware system commands:

- Standardize designs—with inter- and intra-system standardization.
- Re-use in new design existing component/equipment already supported in depth.
- Preclude use of limited application and poor performance component/equipment.
- Exercise stringent change control.
- Use procurement techniques to restrain proliferation.
- Standardize items (parts), materials, processes and services.
- Effect item entry control in design selection and provisioning.

Top level policy is a firm foundation for proper program execution. The Navy's policy was buttressed when the President issued his memorandum of Sept. 16, 1966 (see Chart 2), directing the heads of departments and agencies to improve management and procurement of government property and hardware. The executive memorandum emphasizes the words "make do." The Navy policy for re-use in new design and standardization of components/equipments will facilitate use of existing repair part ranges and effect required management savings. Program implementation is progressing well:

- NAVEX has issued its implementing instruction (NAVEXINST 4120.1) which was developed under the leadership of Frank Berg, Electronics Standards Office (ELEX-OOT), NAVEX. Specific tasks are being milestone within that command.

- NAVSHIPS is correlating the standardization tasks it has under way and has an advanced draft of a comprehensive implementing instruction. Morris Alpert, Standardization Branch (NAVSEC-6083), Technical Concepts and Methods Office, Naval Ship Engineering Center (NAVSEC), is coordinating this effort within the Washington headquarters of NAVSEC. Significant input is being provided by the NAVSEC Mechanicsburg Division, which is headed by Captain Carl B. Ihli, USN, (see article, "Standardization—The Answer to the Fleet Spare Parts Dilemma," *Defense Industry Bulletin*, Volume 4, No. 1, January 1966).

STANDARDIZATION

THE WHITE HOUSE
WASHINGTON

September 16, 1966

MEMORANDUM TO THE HEADS OF DEPARTMENTS AND AGENCIES

"... I want a special sustained Government-wide effort started immediately to improve the procurement and management of property. Each of you is requested to—

"... eliminate procurement of items being requested only to satisfy a desire for latest styles or designs. The entire organization must be instilled with a "make do" attitude....

"In furtherance of this effort, the Secretary of Defense and the Administrator of General Services will....

".... accelerate efforts to reduce the number of items in the Government's supply systems by (1) establishing effective controls to prevent new items from entering the supply systems unless they are essential, and (2) by developing standards and requiring that standard items be used and that items which have unnecessary nonstandard features are eliminated from the system"

/signed/ LYNDON B. JOHNSON

Chart 2

- NAVAIR plans are in approximately the same stage of development as NAVSHIPS. Frank B. Ingham, Standardization Section (NAVAIR-52021), Technical Support Branch, Engineering Division, NAVAIR, is guiding this effort with significant input from the Weapons Engineering Standardization Office (WESO), Philadelphia. Norman Raditz, WESO, is providing engineering liaison and expertise. The Aviation Supply Office, Philadelphia (Phil Jensen, coordinator), is assisting by providing statistical information on component/equipment application and population.

- NAVORD has developed preliminary planning and is preparing implementing instruction. This task is being coordinated by Tom McGee, Standardization Branch (NAVORD-9343), Engineering Support Division, NAVORD.

- NAVSUP has issued its plan which primarily treats with materials handling equipment, the major hardware area under NAVSUP cognizance.

- NAVFAC has established a task group to review procurement/standardization practices within that command. This group is headed by Captain W. A. Walls, CEC, USN, Assistant Commander for Engineering and Design, NAVFAC.

Some of the specific actions taken to date include the following:

- New techniques employed by the Fast Deployment Logistics (FDL) Ship include the development and use of a Standard Component List (SCL) for design selection of shipboard components/equipments. The SCL lists those reliable, in-service components/equipments having application to three or more ships of the active fleet. It, or variations thereof, will also be applied during design of the new nuclear aircraft carrier (CVAN-68), the Large General Purpose Amphibious Assault Ships (LHAs) and, possibly, the new destroyer/destroyer escorts (DX/DXGs).

- Ship identity is being programmed by conformance with a Five-Year Design Objective (FYDO) which phases major ship changes to an optimum standardization advantage.

- Multi-ship / multi-year procurement has resulted in application of specifications requiring identity within the buy.

- Central procurement of identical components/equipments by "lead-yards" for "builds" in more than one yard has strong potential for constraining make and model proliferation.

- Standardization contract clauses have been placed in over \$700 million worth of new construction contracts, giving incentives of up to \$200,000 per ship for using 90 percent or more of components/equipments already installed in the active fleet.

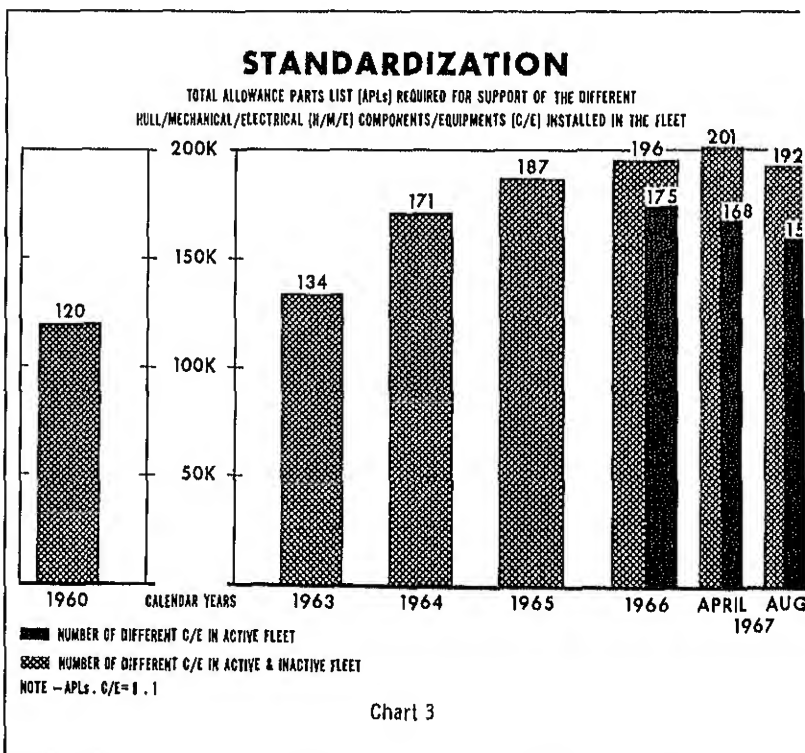
- Requirements have been placed in ship specifications so that machinery and equipment, which are functionally interchangeable, will be identical within the same ship.

- Life cycle costing—not just low bid, but least cost to the Government for entire life cycle, including chief costs, associated with new support parts, new drawings and manuals, training and test equipment, and increased maintenance—is being applied progressively in procurement of components/equipments.

In the area of provisioning, the Navy is working with the Department of Defense Item Entry Control Office to further the ongoing effort to control item entry in the military supply system. A network of Defense Technical Review Activities (DTRAs)

has been set up to screen new input from provisioning to determine parts interchangeability relations and to match out actual duplicate items which may have been hidden by differing identification or tech data. These review activities are located within the Military Departments and the Defense Supply Agency complex. They operate under a Service assignment by Federal Supply Class (FSC). For example, the Aviation Supply Office in Philadelphia has a data bank of identification cards, drawings, catalogs, etc., for all parts used by the four Services in FSC 2840—Aviation Gas Turbine and Jet Engines and Components thereof. All new parts entering the military supply system in that class go to the Aviation Supply Office for a technical characteristics screen prior to the assignment of Federal Stock Numbers. It is the responsibility of the Aviation Supply Office to match out and control item duplication within the class.

With application of such new management techniques as integrated logistic support, concept formation, and contract definition, engineering and procurement are being treated less like discrete functions. This development permits intertwining of standardization as a good



ness practice throughout the fabric of hardware acquisition. The Navy program has two immediate objectives:

- Full implementation of the standardization policy of the Office of the Chief of Naval Operations and the Naval Material Command.

- Increased visibility of each system command's standardization posture *viz.*, the proper presentation of quantitative data showing the population of different components/equipments—Chart 3 is an example). This visibility permits pinpointing trends requiring special standardization treatment.

Standardization shall be considered whenever a potential exists for using it as the mechanism for improving supportability of military hardware. Engineering and procurement latitude permit its application without foregoing technological advance and requisite competition.

The continuing goal shall be to stem proliferation and, by backfitting and attrition of non-standard components/equipments, reduce the great complications inherent in supplying wide ranges of different things to the Fleet.



Harry Dickinson has served as the senior technical associate for standardization under the Director of Standardization and Configuration Management, Naval Materiel Command, for the past 18 months. He has also served with the Engineering Branch of Naval Material Command and with the Bureau of Supplies and Accounts.

FY 1969 Request for Military Construction Submitted to Congress

The Defense Department has submitted to the Congress a military construction authorization bill for FY 1969 totaling \$1,877,687,000, requesting new authorization in support of the Military Services, the Defense Agencies, and the Reserve components.

The projects for which authorization has been requested are located at 321 military installations in the United States, and at overseas bases in the Caribbean, Europe, Pacific Islands, Japan, Korea and Southeast Asia.

Primary objective of the proposed new construction is to strengthen and improve the combat readiness and capabilities of military land, sea and air forces wherever they are stationed, and to provide them with the modern facilities required to support the advanced weapons and defensive systems with which they are equipped.

Additionally, this FY 1969 Military Construction Authorization Program contains \$227.3 million for construction of facilities in support of the Sentinel Anti-Ballistic Missile System on which a deployment decision was announced last September.

Also included in the total authorization request is \$589,700,000 for military family housing, and \$11,800,000 for homeowners assistance. New family housing accounts for \$42,850,000 of this total amount and contemplates the construction of 2,000 units in the United States. The balance represents continuing requirements necessary for maintenance and operation, improvements to existing mortgages, leasing costs, and payments of principal and interest on mortgage obligations.

The table below presents details concerning the major elements in dollars for the authorization requested:

	United States Locations	Overseas Locations	Locations Not Specified	Total
Army	\$363,980,000	\$242,474,000	\$ 10,000,000	\$ 616,454,000
Navy	251,613,000	62,651,000	10,000,000	324,264,000
Air Force	153,603,000	71,866,000	10,000,000	235,469,000
Reserve Components	16,300,000	—	—	16,300,000
Defense Agencies	13,051,000	649,000	70,000,000	83,700,000
Subtotal	\$798,547,000	\$377,640,000	\$100,000,000	\$1,276,187,000
Military Family Housing	—	—	—	589,700,000
Homeowners Assistance	—	—	—	11,800,000
Total	\$798,547,000	\$377,640,000	\$100,000,000	\$1,877,687,000

New Thesaurus of Scientific Terms Available

A new comprehensive Thesaurus of Engineering and Scientific Terms (TEST), published jointly by the Defense Department and the Engineers Joint Council, is now available.

The result of a 29-month collaborative effort, the 176-page thesaurus is an interdisciplinary vocabulary of more than 23,000 main terms. The book standardizes lan-

guage used to index scientific and engineering information.

Organizations registered with the Defense Documentation Center may obtain copies by requesting the Thesaurus of Engineering and Scientific Terms (TEST). Other interested parties may purchase copies from the Engineers Joint Council, 345 E. 47th St. New York, N.Y. 10007, for \$25 a copy.

Public Affairs Liaison with Industry Instruction Published

The Defense Department has issued DOD Instruction 5410.20, "Public Affairs Liaison with Industry," dated Feb. 9, 1968, which provides guidance and procedures governing DOD cooperation with industry in public affairs matters in general, industry-sponsored events, and in advertising defense themes and products.

The objective of the instruction is to assure understanding by American industry—particularly defense contractors—of the plans, programs and activities of DOD through wide dissemination of information consistent with national security, and through cooperation with industry in public relations activities, which are not contrary to national or DOD interests. In accordance with this objective, DOD components are encouraged to cooperate with industry at local and regional levels. Such cooperation must conform to the provisions of DOD Directive 5410.18, "Community Relations," dated Feb. 9, 1968, which states that "Department of Defense participation and cooperation must not directly or indirectly (a) endorse or selectively benefit or favor, or appear to endorse or selectively benefit or favor, any private individual, sect, fraternal organization, commercial venture. . . ." DOD components are required to advise the Assistant Secretary of Defense (Public Affairs) of any local or regional activity which has the potential of being escalated, or which has been escalated by unforeseen circumstances, to national or international interest.

Implementation of the provisions of DOD Instruction 5410.20 is the responsibility of the Business and Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). The Business and Labor Division was established in July 1964 to serve as a point of contact at the seat of government for public affairs communication between the Defense Department and the business and labor communities. Organization and personnel assigned to the division are shown in Figure 1.

The Business and Labor Division is responsible for developing and directing continuing liaison programs designed to keep industry, defense-oriented associations, and labor organizations informed on the policies, objectives and activities of DOD and its components. In addition, it works with representatives of these groups on public affairs projects and programs of mutual interest, and coordinates the participation of the organizational elements of the Office of the Secretary of Defense, as well as those of the Military Departments and Defense Agencies, in public information programs and activities of the business and labor communities.

The publication in which this article is published, the *Defense Industry Bulletin*, is one of the services offered by the Business and Labor Division to the industrial community. The Bulletin serves as a means of communication from DOD and its components to industry. Published monthly and distributed without cost, the maga-

zine's purpose is to provide information on DOD policies, procedures and activities and to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of national security.

Cooperation and assistance provided to industry by the Business and Labor Division, under the provisions of the instruction, include such industry-sponsored events as meetings, exhibits, and public ceremonies. Industry participation in DOD-sponsored events is also included. Guidance on the use of DOD insignia, themes and products in advertising, and motion picture production is also provided.

The new instruction does not in any way alter the policies and procedures relating to defense contracting activities as stated in the Armed Services Procurement Regulation, the Industrial Security Manual for Safeguarding Classified Information, or any other official DOD publication.

Business and Labor Division Directorate for Community Relations Office of Assistant Secretary of Defense (Public Affairs)

Room 1E 764, The Pentagon
Washington, D.C. 20301

Capt. John A. Davenport, USN
Chief, Business and Labor Division
(202) OXford 5-0208

Business Activities Office (202) OXford 5-2036 or OXford 5-2733

Lt Col. Travis M. Gafford, USA Business Activities Officer
Mr. Rick La Falce Business Activities Specialist

Labor Activities Office (202) OXford 5-2733

Mr. William P. Welsh Labor Activities Specialist

Defense Industry Bulletin (202) OXford 5-2709

Lt. Cdr. E. W. Bradford, USN Editor
Mrs. Cecilia Pollok McCormick Associate Editor
Capt. Frank W. Kafer, USAF Associate Editor

Figure 1.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Dr. Stephen J. Lukasik has been appointed Dep. Dir., Advanced Research Projects Agency. Dr. Lukasik has been serving as Acting Dep. Dir.

William K. Brehm has been sworn in as Dep. Asst. Secretary of Defense (Land Forces Programs), Office of the Asst. Secretary of Defense (Systems Analysis). The position was elevated to deputy secretary level in October at which time Mr. Brehm assumed the position of Acting Dep. Asst. Secretary.

Maj. Gen. Donald R. Pierce, USA, has been named Commander, Test Command, Defense Atomic Support Agency, and Commander, Joint Task Force Eight. Both commands are located at Sandia Base, Albuquerque, N.M. He succeeds Maj. Gen. Arthur W. Oberbeck, USA.

RAdm Robert H. Weeks, USN, has been assigned as Vice Dir., Defense Communications Agency, Arlington, Va., succeeding Maj. Gen. George E. Pickett, USA.

Col. George F. Hamel, USA, has succeeded Col. Joel B. Stephens, USA, as head of the Directorate for Community Relations, Office of the Asst. Secretary of Defense (Public Affairs). Col. Hamel moved up to the position from duty as chief of the Veterans & Civic National Organizations Division. Col. Stephens is the new Public Information Officer at the U. S. Military Academy, West Point, N. Y.

Col. Norman H. Gold, USA, has been named Dir. of Freight Traffic at Headquarters, Military Traffic Management and Terminal Service. He replaces Capt. Francis Grubb, USN, who has retired.

DEPARTMENT OF THE ARMY

Maj. Gen. Walter E. Lotz Jr., has been named the new Commanding General of the Strategic Communications Command succeeding Maj. Gen. Richard J. Meyer who has retired.

Brig. Gen. Wallace L. Clement is the new Dir. of Doctrine at the Army Combat Developments Command, Fort Belvoir, Va. He succeeds Brig. Gen. Roy L. Atteberry.

The Army Combat Developments

Command Experimentation Command, Fort Ord, Calif., has a new commanding general. He is Brig. Gen. Frederick C. Roecker Jr.

Col. Vincent H. Ellis is the new Dep. Commander, Army Tank Automotive Command, Warren, Mich.

DEPARTMENT OF THE NAVY

Charles A. Bowsher has been sworn in as Asst. Secretary of the Navy for Financial Management. He was nominated for the position when Charles F. Baird vacated it to become Under Secretary of the Navy.

Dr. James H. Schulman has been named Associate Dir. of Research for Materials at the Naval Research Laboratory, Washington, D.C.

Dr. Boyd E. Olson has been named Dep. Scientific and Technical Dir. of the Naval Oceanographic Office, Washington, D.C.

RAdm. Marshall W. White is the new Commander of the Navy's Pacific Missile Range, Point Mugu, Calif.

Capt. John C. Doherty has been assigned as Asst. Commander, Naval Ordnance Laboratory, White Oak Md.

Capt. John R. Lindsay has been reassigned to duty as Dep. Dir., Deep Submergence Systems Project, Naval Material Command.

DEPARTMENT OF THE AIR FORCE

The following named officers have been nominated for appointment to the temporary general officer grades indicated:

Major General;

Brig. Gen. John L. Martin Jr., Dir., Special Projects, Office of the Secretary of the Air Force; Brig. Gen. Lee V. Gossick, F-111 Systems Program Dir., Aeronautical Systems Div., Air Force Systems Command; Brig. Gen. Daniel E. Riley, Commander, Air Force Contract Management Div., Air Force Systems Command; Brig. Gen. Henry B. Kucheman Jr., Vice Commander, Aeronautical Systems Div., Air Force Sys-

tems Command; Brig. Gen. Frederick E. Morris Jr., Commander, Advanced Logistics Systems Center, Air Force Logistics Command; Brig. Gen. James F. Hackler Jr., Dep. Dir. of Information, Office of the Secretary of the Air Force.

Brigadier General:

Col. John French, Executive to Vice Chief of Staff, USAF; Col. Maurice A. Cristadoro, Commander, Systems Engineering Group, Air Force Systems Command; Col. Spencer S. Hunn, Vice Commander, Electronic Systems Div., Air Force Systems Command; Col. Fred W. Vetter Jr., Military Asst. to the Secretary of Air Force; Col. William G. King Jr., Asst. Dep. Chief of Staff (Operations), Air Force Systems Command; Col. Roger K. Rhodarmar, Dep. Asst. for Reconnaissance, Dep. Chief of Staff (Research & Development), Hq., USAF; Col. Harvey W. Eddy, Dep. Asst. for Research & Development Programming, Dep. Chief of Staff (Research & Development), Hq., USAF; Col. David L. Carter, Dep. Dir. for Research & Development, Office, Space Systems, Office of the Secretary of the Air Force; Col. James A. Bailey, Chief, Airborne Radio Navigation Inventory Management Div., Warner-Robins Air Materiel Area, Air Force Logistics Command; Col. Alfred L. Esposito, Chief, F-111 Programming, Dep. Chief of Staff (Systems & Logistics), Hq., USAF; Col. Donald H. Ross, Chief, Tactical Airlift Div., Dep. Chief of Staff (Programs & Resources), Hq., USAF; Col. Abraham J. Dreiseszun, Dir., Procurement & Production, Air Force Logistics Command; Col. Warner E. Newby, Dep. Dir., Production & Programming, Dep. Chief of Staff (Systems & Logistics), Hq., USAF.

Brig. Gen. Leo A. Kiley has taken command of the Air Force's Office of Aerospace Research, Arlington, Va. He replaces Maj. Gen. Ernest A. Pinson who is now Commandant of the Air Force Institute of Technology.

Col. Eugene Finke has been assigned as Dir., Research Programs, Office of Aerospace Research.

The Government's Role in Minding Its Contractor's Business

Brigadier General Daniel E. Riley, USAF

One persistent problem in the defense industry/government relationship is the extent to which the Government does, should, or should not "mind the business" of its contractors.

It is a problem with which the Air Force Contract Management Division (AFCMD) of the Air Force Systems Command is actively concerned. The division has plant representatives in 22 major aerospace companies across the country and is currently managing about 6,000 prime contracts with a total face value of approximately \$42 billion. Among the systems for which AFCMD administers contracts are:

- Aircraft—the C-130, C-141, C-5A, T-38 and the F-111.
- Ballistic missiles—the Air Force Minuteman and Titan II, SCRAM (Supersonic Combustion Ramjet), the Navy Polaris and Poseidon.
- Space programs — the MOL (Manned Orbiting Laboratory), and the National Aeronautics and Space Administration's Saturn space launch vehicle.
- Advanced research projects—the Air Force PRIME (Precision Recovery Including Maneuvering Entry) SV-5D lifting body vehicle.

To whatever extent the Government is minding the business of the contractors involved in these programs, it is doing so largely through Air Force plant representatives. Plant representative office staffs range from 50 to 200 people. They provide on-site engineering service, quality assurance, and technical cognizance over performance, scheduler and cost. They also interpret DOD contract policies and objectives, and provide service as required by the contractor and the Air Force system program director.

AFCMD also has five detachments at Air Force test sites, where final testing is done, to administer the contractual provisions of the test pro-

gram. Personnel at these sites provide on-the-spot monitoring of contractor test operations, check hardware performance, and insure that the contractor fulfills his flight-test responsibilities.

The ideal degree of active government participation in a contractor's system management is a delicate balance between maximum protection of the taxpayer's interests, and minimum distortion of the free enterprise system. It would achieve what might be called "responsive visibility," assuring that the Government gets sufficient information and control to see program progress and problems clearly at any given moment, and to step in effectively with its own management resources only where and when it becomes apparent



Brig. Gen. Daniel E. Riley, USAF, is the commander of the Air Force Contract Management Division of the Air Force Systems Command, at Los Angeles Air Force Station, Calif. Previously he was vice commander of AFSC's Electronic Systems Division. During his career he has held various positions in procurement management. He is a graduate of the Industrial College of the Armed Forces and holds a masters degree in business administration from the University of Michigan.

that the contractor's effort is inadequate and headed for trouble.

Such a balance is not easy to achieve, though there are indications that we are making some noteworthy progress toward it today.

Historically, the degree of government active engagement in the internal management of defense industry has fluctuated with changes in the nature of defense material, in the urgency of hardware needs, and in government philosophies and techniques of procurement.

The trend during the 1950s and very early 1960s, for a number of reasons, was toward increasingly deep government engagement. At that time revolutionary and extremely complex ballistic weapon and space systems were being developed under the pressures of urgent priorities. Both Government and industry were pioneering wholly unfamiliar territory, in high-risk systems of such complexity that development costs were too great to be borne by private industry. There was, of necessity, a heavy reliance on sole source procurement, since no truly competitive capabilities had yet been developed within industry for these types of systems. In 1961, for instance, 85 percent of the Air Force's awards were non-competitive; 46 percent were cost-plus-fixed-fee.

The amount of autonomy given to industry, as well as industry's profit, is related directly to the degree of risk which industry assumes, and to the element of competition in the procurement atmosphere. With both at a low ebb, government intervention in contractor management tended to increase.

Another aspect of early space-age procurement, that had a tendency to stunt development and improvement of industry's internal systems management capabilities, was the government practice of "piecemeal" procurement. Because it was difficult, if

not impossible, to estimate in advance the exact total performance and cost of the systems, it became the normal practice to award only the development work at the outset of a program. Unless the contractor was a spectacular failure in this phase of the program, he was practically assured of the follow-on procurement, with no commitment concerning ability to control costs, assure performance, or meet schedules. The alternative, selection of a new contractor, meant duplication of the greatest part of the original development costs. The Government tended to over-compensate for the known, but unavoidable shortcoming of this procurement method by assuming an unusually active role in monitoring industry's internal management.

Contributing still further to the tendency toward over-control by the Government was the mid-century revolution in the tools and techniques of data processing and storage. Helpful as the new computer capabilities were, they tended to encourage the proliferation of new reporting requirements. The Government became involved in evermore detailed surveillance of industry management.

By the early 1960s, however, the procurement atmosphere, particu-

larly in the Air Force, was beginning to undergo marked changes. After almost a decade of highly concentrated space-age experience, an invaluable working knowledge of the realities of space-age technology has been acquired. Greater attention was gradually concentrated on integrated defense planning and management, more effective use of resources, and improvement of the acquisition process and the general climate of the government/industry working partnership.

One angle of approach was the drastic reduction of cost-plus-fixed-fee contracts. A substitute was the negotiated fixed-fee contract, based on weighted guidelines which took into consideration the element of risk for the contractor and the contractor resources, capital and skills required.

The usefulness of the fixed-fee contract has been further enhanced by the addition of incentive arrangements which reward the contractor for improving upon specified hardware performance, cost, or delivery schedule, and penalize him for failure to meet performance, cost, or schedule objectives originally established. This prospect of higher profits and threat of loss constitutes a most effective incentive to industry to

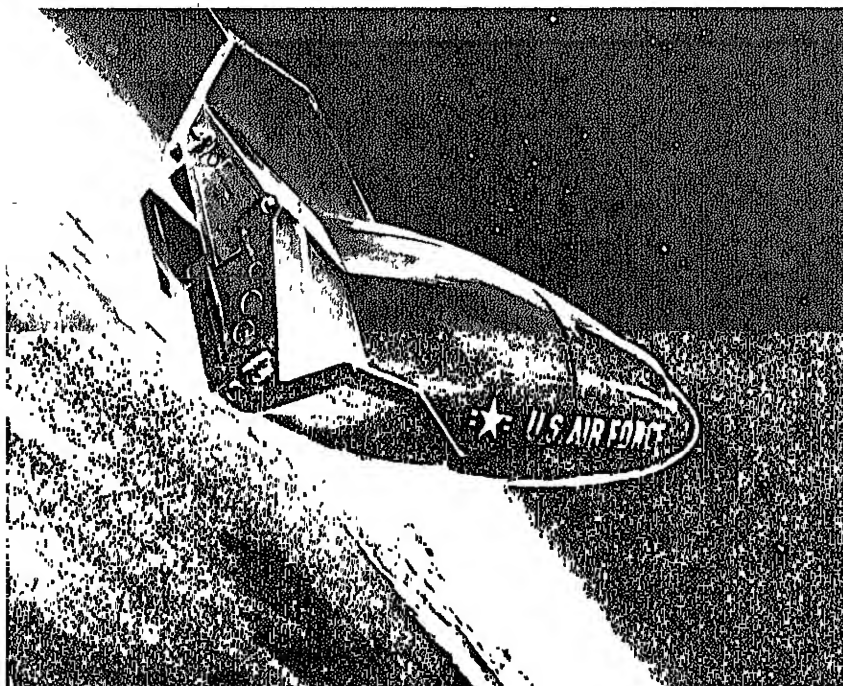
put forth a maximum effort in good management.

The successful shift from cost-plus to fixed-fee with incentive contracting is amply attested by the record. In FY 1962, 46.9 percent of all Air Force contracts were cost-plus-fixed-fee. By FY 1967, the percentage had dropped to 5.1.

Improved source selection in awarding contracts to industry is also proving to be a promising approach to a healthier balance in the government/industry management relationship. An Armed Services Procurement Regulation revision of June 1, 1965, sets forth requirements for an exhaustive pre-contract investigation of contract capabilities, as a measure to reduce the necessity for remedial government intervention at a later date. In addition, the Contractor Performance Evaluation Report, inaugurated in 1963, provides a continuing semi-annual evaluation of performance on certain contracts. This report provides a long-term incentive to contractors by creating, within the Government, a "memory" of contractor performance and a means for considering this record in future source selections and negotiations.

For the last several years, also, both industry and Government have been making concentrated efforts to clean up the tropical undergrowth of management systems and reporting requirements that has resulted from the data management revolution. The Systems Management Analysis Group of the Aerospace Industries Association and the Office of the Secretary of Defense combined their findings in 1966. The result was DOD Directive 7000.1, establishing one central control point for all management systems within the Defense Department. This responsible office, the Directorate of Management Systems Control in the Office of the Assistant Secretary of Defense (Comptroller), is now working on improving "responsive visibility" by some judicious thinning of the management systems thicket.

One final development, also making a substantial contribution to an improved management balance, is the trend toward total package and life cycle procurement. One of the basic principles of total package procurement is a high degree of disengagement of control over contractors,



An artist's concept of the Air Force PRIME (Precision Recovery Including Maneuvering Entry) SV-5D vehicle.

after a long-term program has been established under competitive conditions. Total package procurement is the antithesis of the piecemeal approach. It is procurement through one-time open competition of a maximum number of elements of a system, throughout engineering, development, production, maintenance, etc.

Though it does have certain inherent limitations and disadvantages, total package procurement puts the competitive muscle tone back into government procurement. It integrates and simplifies the procurement process as a whole. It gets the contractor back into business on his own, permitting maximum government disengagement from his internal management.

All of these trend makers of recent years—the strengthening of the competitive element in contracting, improved source selection, tightening control of systems management and reporting requirements and techniques, the introduction of new procurement methods such as the total package concept—give promise of progressively improving government/industry working relationships. The Government is as eager as industry to attain the closest thing to an uncomplicated “we buy—you sell” relationship that our public trust will permit. Government procurement by its very nature can never be a simple process. However, prospects are certainly looking up for achieving a better balance of the management skills which both Government and industry possess. In the process, the Government can expect to get better value for the taxpayer's dollar, and industry can look forward to profits and autonomy which more nearly reflect the effectiveness of industrial management as proven by performance.

Note

The item concerning the establishment of the DOD-Industry Assets Managements Systems Advisory Committee, carried on page 35 of the February 1968 issue of the *Defense Industry Bulletin*, included a list of current members. The name of one member, A. J. Rothstein, Electronic Industries Association, was inadvertently omitted in the original release.

Defense Procurement Conference Program Scheduled for Second Half of FY 1968

The fifth of the current series of Defense Department procurement conferences will be held at El Paso, Tex., April 11.

A total of 17 conferences have been scheduled for the second half of FY 1968 as part of DOD's continuing effort to develop additional competitive sources, large and small, to meet defense requirements.

Procurement conferences are designed to provide a single location for businessmen and potential contractors to become acquainted with the Federal procurement and contract process; to have practical individual discussions with specialists on business opportunities in the Army, Navy, Air Force and Defense Supply Agency; and to be counseled on the activities of the Defense Contract Administration Services, the Defense Documentation Center, the Defense Specifications Center, and other defense organizations concerned with prime contracting and subcontracting.

An item of special interest at the conferences will be the \$30 to \$50 million in current Invitations for Bid (IFBs) and Requests for Proposals (RFPs), including a number of “small purchase” (\$2,500 and under) packages which will be on hand with Army, Navy, Air Force, and Defense Supply Agency counselors.

A new approach during this second half of FY 1968 will be tried at the procurement conference to be held in the Tri-Cities of Richland, Pasco, and Kennewick, Wash., which will be research and development oriented. This procurement functional area will be highlighted in the symposiums held during the conference on preparation of unsolicited proposals, the Defense Documentation Center services, etc.

Major defense prime contractors play an active part in these conferences. A number of DOD's prime contractors, usually from the area contiguous to the conference site, will be on hand to discuss subcontract opportunities.

The Defense Department will be joined in all procurement conferences by other Federal agencies, including the Department of Commerce, the Small Business Administration, the

National Aeronautics and Space Administration, and General Services Administration. In addition, the Post Office Department, the Atomic Energy Commission, Veterans Administration, Department of Interior, Department of Agriculture, and other agencies will participate in specific conferences which relate to their activities.

Following is a listing of the dates, locations and contacts of procurement conferences scheduled for the remainder of the fiscal year:

April 11	El Paso, Tex. Milton E. Hopper Phone (915) 533-1421
April 17	Farmington, N.M. Jerry Brown Phone (202) 225-2365
April 22-23	Richland, Wash. Tom C. Hynes Jr. Phone (509) 946-5162
April 23	Sioux Falls, S.D. Gary Kizzler Phone (605) CA 4-5911, Ext. 307
April 30- May 3	Orlando, Fla. Russell H. Nahm Phone (305) 424-9581
Week of May 7	Brooklyn, N.Y. John A. Davis Phone (212) 625-5778
May 10	Queens, N.Y. Michael Goldenthal Phone (212) RA 8-3060
May 17	Columbus, Ga. Lennie Davis Phone (404) 324-3091
May 24	Bethpage, N.Y. Bertram F. Sternfield Phone (516) LR 5-3201
June 4	Anaheim, Calif. James H. Hannam Phone (202) 225-2965
June 11	Nashville, Tenn. Contact to be named later. Interim contact—Morris Questal, Navy Dept., Washington, D.C. Phone (202) OX 6-2960
June 25-26	Harrisburg, Pa. Dean W. Moore Phone (717) 233-5668



Defense Procurement Circulars

Distribution of Defense Procurement Circulars is made automatically by the U. S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

Defense Procurement Circular No. 58, Jan. 31, 1968. (1) Progress Payments. (2) Assignment of Contracts for Administration. (3) Disclosure of Audit Results to Contractors. (4) Equal Employment Opportunity—Assurance on Nonsegregated Facilities. (5) Cost-Sharing Policies. (6) Service Contract Act. (7) Procurement Management Reporting System. (8) Clauses for Fixed-Price Construction Contracts.

Defense Procurement Circular No. 59, Feb. 14, 1968. (1) Material Inspection and Receiving (MIRR) (DD Form 250 Series).

Research Reports

Authorized DOD contractors and grantees may obtain these documents without charge from Defense Documentation Center Cameron Station Alexandria, Va. 22314

Others may purchase these documents at a price of \$3 each (microfiche 65¢), unless otherwise indicated, from:

Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Conceptual Study of Electrical Power Transmission Systems to Deep Ocean Installations. General Dynamics Corp., Groton, Conn., for the Navy, Aug. 1967, 451 p. Order No. AD-662 037.

Sorption of Gaseous Hydrocarbons at Fuel Cell Catalysts of the Platinum Metal Group. Battelle Institute, Columbus, Ohio, for the Army, Sept. 1967, 48 p. Order No. AD-661 381.

Development of Improved Zinc Batteries for High Temperature Storage. Marathon Battery Co., Wausau, Wis., for the Army, Nov. 1967, 33 p. Order No. AD-661 306.

Study of Thermoelectric and Thermionic Power Conversion. Tyco Labs, Inc., Waltham, Mass., for the Navy, Oct. 1967, 235 p. Order No. AD-661 455

Stream Powered Generator. Philco-Ford Corp., Newport Beach, Calif., for the Navy, July 1967, 64 p. Order No. AD-660 009.

Guide to Test Methods for Plastics and Related Materials. Picatinny Arsenal, Dover, N.J., Aug. 1967, 84 p. Order No. AD-662 049.

Wind Tunnel Simulation of Head-on Bow Wave—Blast Wave Interactions. Naval Ordnance Lab., White Oak, Md., Aug. 1967, 129 p. Order No. AD-661 790.

An Analytical Cost Comparison of Computer Operating Systems. Systems Development Corp., Santa Monica, Calif., for the Air Force, June 1967, 213 p. Order No. AD-661 983.

Density/Conductivity Anomaly for Non-Constancy of Composition in Seawater. Naval Underwater Weapons Research & Engineering Station, Newport, R.I., Oct. 1967, 21 p. Order No. AD-661 234.

Reference Design Study of Mist-Jet Propulsion Systems in Captured-Air-Bubble Ships. Naval Ship Research & Development Center, Washington, D.C., Nov. 1967, 72 p. Order No. AD-661 801.

Conceptual Study of Electrical Power Transmission Systems to Deep Ocean Installations. General Dynamics Corp., Groton, Conn., for the Navy, Aug. 1967, 451 p. Order No. AD-662 037.

Model Tests of Stepped Planning Boat With an Adjustable Stern Stabilizer. Naval Ship Research & Development Center, Washington, D.C., May 1967, 62 p. Order No. AD-661 792.

Military Transfer of Technology. Howard University, Washington, D.C., for the Air Force, March 1967, 276 p. Order No. AD-660 537.

Direct and Inverse Problems for Integral Equations Via Initial-Value Methods. Rand Corp., Santa Monica, Calif., for the Air Force, Oct. 1967, 40 p. Order No. AD-661 550.

GOVERNMENT PRINTING OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

United States Activities in Spacecraft Oceanography. Presents some examples of opportunities for a broad extension of ocean observation techniques. Oct. 1, 1967. 44 p. il. 65c.

Navy Systems Design Guidelines Manual, Electronic Packaging. Provides a compendium of complementary electronic packaging approaches developed under the direction of Navy facilities for the organization and construction of electronic systems. 1967. 277 p. il. D201.6/12: E12. \$3.

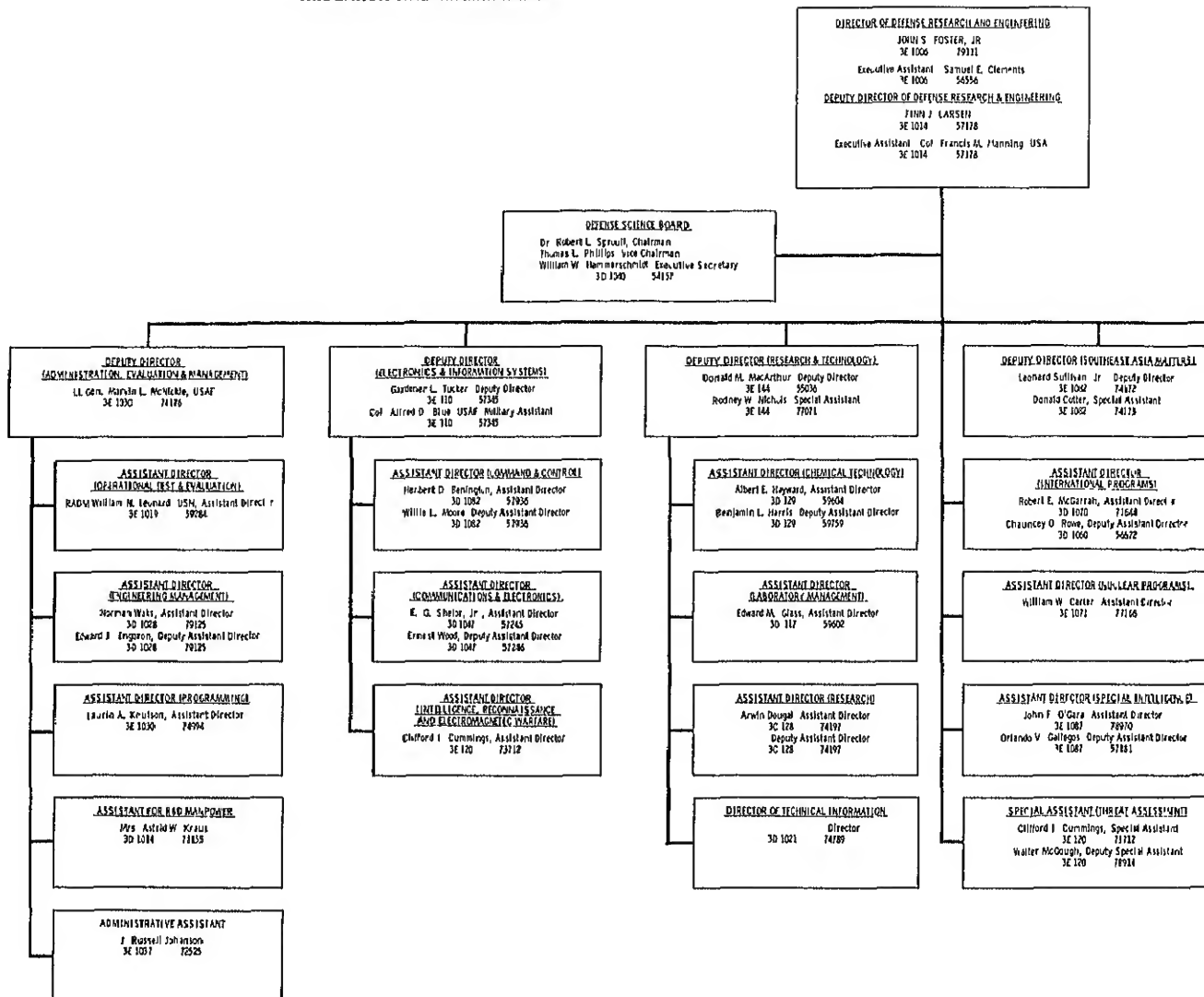
Department of the Navy RDT&E Management Guide. Provides an overview of organization for research, development, test and evaluation (RDT&E) and procedures for planning programming, budgeting, appraisal, and procurement. Rev. 1967. 308 p. il. D201.6/12:M31/967. \$1.75.

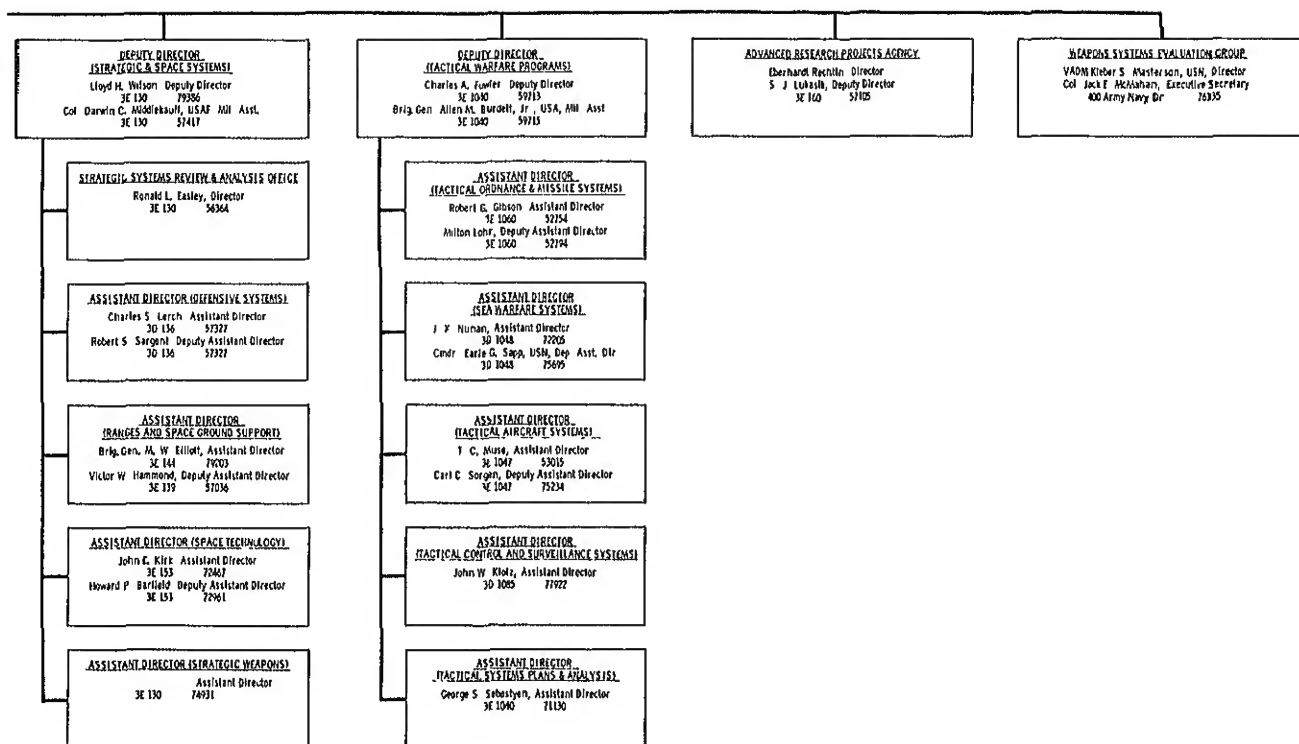
Oceanography '66, Annual Report Naval Oceanographic Office. Provides a brief summary of the programs and efforts carried on at the U.S. Naval Oceanographic Office. 1967. 62 p. il. D203.1:966 40¢

Effective Use of the Sea, Report of the Panel On Oceanography of the President's Science Advisory Committee. Presents findings and conclusions of the Panel on Oceanography. 1966. 144 p. il. Pr 35.8:Sci 2/Se 1. 60¢

Armed Services Procurement Regulation, Supplement No. 3, Property Administration, Aug. 1, 1967. Prescribes uniform procedures and techniques to meet management data requirements of the Government, and to assure performance of property control to protect the interests of the Government at a minimum cost through a uniform DOD property administration program. 1967. 38 p. D1.13/2-2:3. 25¢.

**OFFICE OF THE DIRECTOR OF DEFENSE
RESEARCH AND ENGINEERING**







MEETINGS AND SYMPOSIA

APRIL

Photochemistry and Radiation Chemistry Symposium, April 22-24, at Natick, Mass. Co-Sponsors: Army Natick Laboratories and the National Academy of Sciences-National Research Council Advisory Board. Contact: Dr. E. Hayon, Head, Physical Chemistry Laboratory, U.S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000, Ext. 137.

Frequency Control Symposium, April 22-24, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Electronic Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. Contact: Director, Electronics Components Laboratory, Army Electronics Command, Attention: AMS EL-KL-ST (Mr. M. G. Timm), Fort Monmouth, N.J. 07703, Phone (201) 535-2826 or 1728.

Advance Planning Briefing on Electronic Components, April 25-26, at Fort Monmouth, N.J. Co-Sponsors: National Security Industrial Association and the Army Electronics Command, Fort Monmouth, N.J. Contact: Dr. Eduard A. Gerber, Electronics Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. 07703.

MAY

Vacuum Ultraviolet Radiation Physics-Interaction with Solids Conference, May 1-3, at Gatlinburg, Tenn. Co-sponsors: Army Research Office-Durham, and the Office of Naval Research, Contact: Dr. Robert Mace, Director, Physics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285.

Interagency Data Exchange Program (IDEP) Sixth Annual Workshop, May 1-3, at the Ambassador Hotel, Los Angeles, Calif. Sponsors: The Army member of the IDEP Policy Board, OCRD, Air Force, Navy, NASA and the North American Rockwell Corp. Contact: Mr. Bobbie Barnett, Army IDEP Officer, MICON, Redstone Arsenal, Ala. 35809, Phone (205) 876-0851.

Fifth National Colloquium on Information Retrieval, May 3-4, at the University of Pennsylvania, Philadelphia, Pa. Sponsors: Moore School

of Electrical Engineering, University of Pennsylvania, Institute of Electrical and Electronic Engineers, Special Interest Group on Information Retrieval, American Documentation Institute Association for Computing Machinery and Frankford Arsenal. Contact: George Schechter, Chief, Objectives Analysis Office, Frankford Arsenal, Philadelphia, Pa. 19137, Phone (215) JE 5-2900, Ext. 3219.

Enhancing the Effectiveness of Fleet Systems—A Problem of Teamwork, Fourth Naval Material Command Systems Performance Effectiveness Conference, May 8-9, at the West Auditorium, Department of State, Washington, D.C. Sponsor: Naval Material Command. Contact: Mr. G. W. Neumann, Executive Secretary, SPE Steering Committee, Naval Ship Systems Command, Code 03511, Washington, D.C. 20360, Phone (202) OX 6-3097.

Universal Aspects of Atmospheric Electricity Conference, May 12-18, in Tokyo, Japan. Sponsors: Air Force Cambridge Research Laboratories, Office of Naval Research and the National Science Foundation. Contact: Capt. J. H. Shock (CRTE), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3636.

Second International Meeting on Silicon Carbide, May 14-16, at Pennsylvania State University, University Park, Pa. Sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and the Corborundum Co. Contact: Mr. C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 2234.

1968 International Conference on Quantum Electronics, May 14-17, at the Everglades Hotel, Miami, Fla. Sponsor: Office of Aerospace Research. Contact: Lt. Col. Robert Kalisch, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5518.

Aerodynamic Noise Symposium, May 20-21, at Toronto, Canada. Sponsor: Office of Aerospace Research. Contact: Maj. D. L. Calvert, Air Force Office of Scientific Research (SREM),

1400 Wilson Blvd., Arlington, Va. 22209, Phone (202), OX 4-5568.

Functional Analysis Conference, May 20-24, at the University of Chicago. Sponsor: Office of Aerospace Research. Contact: Dr. R. G. Pohrer, Air Force Office of Scientific Research (SRMM), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5264.

JUNE

Fourth Conference on Atmosphere Contamination in Confined Spaces, June 4-6, at Dayton, Ohio. Sponsor: Aerospace Medical Research Laboratory. Contact: Dr. Anthony Thomas, 6570 Aerospace Medical Research Laboratory (MRTB), Wright-Patterson AFB, Ohio 45433, Phone (513) 255-5740.

Society of Photographic Scientists and Engineers Annual Conference, June 10-14, at Boston, Mass. Co-sponsors: Rome Air Development Center and the Society of Photographic Scientists and Engineers. Contact: Mr. Pohorence (EMIRC), Rome Air Development Center, Griffiss AFB, N.Y. 13440, Phone (503) 330-7210.

Atomic Physics Conference, June 12-15, at New York University. Sponsors: Army Research Office-Durham, Atomic Energy Commission, National Science Foundation, Air Force Office of Scientific Research, Office of Naval Research, New York University, Brookhaven National Laboratory and the International Union of Pure and Applied Physics. Contact: Dr. Robert Mace, Director, Physics Div., U.S. Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285.

Multivariate Analysis Symposium, June 17-22, at Dayton, Ohio. Co-Sponsors: Aerospace Research Laboratories and Wright State University. Contact: Dr. P. R. Krishnaiah (ARM), Aerospace Research Laboratories, Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3761.

Bioastronautics and the Exploration of Space Symposium, June 23-27, at San Antonio, Tex. Sponsor: Aerospace Medical Div., Air Force Systems Command. Contact: Dr. Mitchell (AMRS), Aerospace Medical Div., Brooks AFB, Tex. 78235, Phone (512) LE 2-8811, Ext. 3211.



FROM THE SPEAKERS ROSTRUM

Excerpts from statement by Dr. John S. Foster, Jr., Dir., Defense Research and Engineering, on the FY 1969 Defense Research, Development, Test and Evaluation Program before the Senate Committee on Armed Services, Feb. 15, 1968.

General Highlights

... I will begin today by outlining highlights of the overall research and development (R&D) effort: changes in threats; ... plans for significant activities beginning or expanding in FY 1969; ... and finally, our proposed budget. ...

Changes in Threats

To manage defense R&D we must examine any shifts in the actual and potential threats to national security. The purpose of each R&D effort must be measured explicitly in terms of improvements to our current capabilities to meet known or possible threats.

I believe I can explain a central component of our R&D management philosophy through a fairly straightforward argument. First, we recognize that the Soviet Union—and China, of course—are still characterized by secrecy. A veil masks many details of their defense planning. This produces uncertainty in our estimates of their current and likely future forces, and even more uncertainty about the pace and goals of their advanced research. This demands that we carry out an aggressive R&D program to guard against surprises.

Because we cannot be sure about the types and numbers of their planned deployments, we must develop, and in some cases even deploy, systems to assure that we will possess an adequate capability. This margin of strategic safety—some choose to call it a margin of superiority—has been substantial. We plan to continue this strategy. We openly explain the strategy in the hope that public disclosure of our general capabilities, our intent, and our R&D objectives, will deter attack and allow us to move toward a less tense peace.

A significant conclusion we draw from this argument is that our re-

search and technology base—the research, exploratory development, and advanced development programs—must be protected carefully and must not be permitted to erode. There is no “technological plateau” now, nor is one about to be created. But, as I will discuss in detail later, we are convinced that our research and exploratory development requires increased support during the next few years to ensure many options—a margin of safety—against any technological challenge. ...

* * * *

Some Major R&D Plans for FY 1969

Each year brings a group of R&D decisions that can influence our defense capability for many years. I want to mention a few of these now.

After the decision to deploy Sentinel [anti-ballistic missile (ABM) system], immediate steps were taken to reorganize our activity to meet two main R&D goals. First, we will support the initial deployment (the Missile Site Radar and Perimeter Acquisition Radar and the interceptors) and strengthen the related Army efforts. Second, we will continue an aggressive R&D program necessary to avoid obsolescence and to upgrade the system if and when required in the future. To help meet the Army's needs for back-up effort, I plan to transfer to the Army some of the Advanced Research Projects Agency (ARPA) scientists and part of the money in the ARPA ballistic

missile defense project. The remaining group in ARPA will explore possibly feasible, novel techniques which could drastically change the offense-defense balance.

Assuming continued success, the recent experiments in overland radar technology permit us to consider a development program that may revamp our current strategic air defenses, which are now vulnerable to low altitude attack. The planned new system would have much increased capability against all altitude attacks, and could offer annual maintenance savings of as much as \$600 million compared with current defenses. This system is expected to include an airborne command and control system (AWACS) and over-the-horizon radars, based upon a much upgraded version of the F-106 interceptor with a new air-to-air-missile.

Studies indicate that the deployment of missiles in “superhard” silos would provide significantly improved survivability against potential improvements in Soviet missile accuracy. Air Force and Defense Atomic Support Agency (DASA) studies and tests confirmed that the technology to build these silos was available. We are initiating engineering development of a prototype silo (hardened) that can hold Minuteman III or a larger missile. ...

We are also augmenting our effort in the strategic bomber penetration field.

To assure our capability for air superiority against improved Soviet aircraft in any environment during the 1975-85 period, we should replace our F-4s, the first-line Air Force and Navy fighters. The advancing technology in engines and airframes, along with more flexible and reliable avionics and weapons, make possible a substantial improvement in fighter capability. A competitive program to demonstrate the total avionics-weapons capability before deciding on a particular design should give us the advantages of the “fly-before-buy” prototype approach. In this way, we hope to achieve a better system with greater assurance at lower program cost.



Dr. John S. Foster Jr.

In the Manned Orbiting Laboratory program, we plan to carry out the first manned launch in the early 1970s. . . .

. . . One of the increasingly significant threats in South Vietnam, for example, is mortar attacks. We have an urgent development effort on experimental countermortar radars. . . .

Some of the R&D areas to be emphasized during FY1969 in supporting the war in Vietnam are: improved sensors, reconnaissance systems, local communications, perimeter defense systems for a variety of bases and villages, psychological warfare, and advanced intelligence data collection and processing systems. . . .

* * * *

Budget

. . . The FY 1969 request research, development, test and evaluation (RDT&E) is summarized in Figure 1. . . .

Strategic Forces

I want to begin my detailed testimony by discussing the Strategic Forces R&D program. . . . I will review major strategic programs in advanced through operational systems development from the viewpoint of our preparations to maintain our Assured Destruction posture. Finally, I will review our nuclear test and preparedness programs.

* * * *

Strategic Offensive and Defensive Forces

. . . I will discuss first the new threats that are "real" or "expected" in the intelligence sense. . . .

Second, I will discuss possibilities that worry me. . . .

Third, I will present the kinds of longer-term potential threats that could be significant if they occurred. . . .

Fourth, I will discuss the evolving threat represented by Communist China and our responses to it.

Finally, I will review the particular threat to our wartime command and control capability and the measures being taken to assure message execution under all circumstance.

• **New Threats—Operational or Near-Operational—and U.S. Preparations.**

Moscow ABM: This is believed to be an area type ballistic missile defense system based around Moscow and may be capable of intercepting

missiles directed at most of Western European Russia.

U. S. Preparations: We are developing penetration aids and multiple warheads to decrease the number of missiles necessary to destroy the targets that could be defended by this system, and to hedge against possible future additions to their missile interceptor force.

FOBS: The fractional orbit bombardment system (FOBS) presents two potential threats. First, it could reduce the warning time available to our bomber forces and, second, it could reduce the area coverage of the Sentinel Spartan interceptors.

U. S. Preparations: We are accelerating the development and deployment of the forward scatter Over-the-Horizon (OTH) warning system to maintain the necessary warning time for our bombers.

Increased ICBM Forces: The Soviet Union is rapidly deploying ICBMs. When the accuracies and numbers of these missiles are considered together, we do not believe these missiles presently pose a serious threat to our total ICBM force as long as our goals for survivability (hardness) are being met.

U. S. Preparations: An extensive review of the in-silo vulnerability of the missile force has been made. A program to upgrade the silo configurations is continuing and further testing procedures are under development. An airborne Launch Control Center (LCC) capability has been developed that can fire the missiles independently of ground LCC survival.

• **Potential Near-Term Threats and U. S. Preparations.**

Possible Accurate ICBMs: Should

Soviet missile achieve greater accuracy or be MIRVed, they would become a threat to the land-based missile component of our strategic retaliatory force.

U. S. Preparations: An engineering development program has been started for a prototype hardened silo to maintain present Minuteman survivability against the higher accuracy threat, and large enough to hold a new large payload missile if, in the future, we decide to deploy one. The planned Sentinel defense system can act as an initial defense of the Minuteman silos. We are maintaining a production capability for Sprint missiles to defend Minuteman. The Missile Site Radars (MSR) are well sited for several deployment alternatives. In addition, for the far term, we are initiating design of new components specifically suited for the defense of super-hardened silos against an extremely advanced threat.

Increased Soviet Submarine Activity: The Soviets now operate patrols within missile range of the U.S. shores, and increasing activity indicates a significantly improved Soviet missile submarine operational capability.

U. S. Preparations: Operational measures are being taken in several programs; for example, we are reducing bomber takeoff delay under conditions of increased alert. To augment the warning presently supplied by shore-based radars, research is continuing on "backscatter" OTH radar by which co-located transmitters and receivers can detect aircraft and missiles at greater ranges. Trade-off studies and analyses are

Research, Development, Test & Evaluation (RDT&E) Budget Request for FY 1969 (\$ Millions)

Research	\$ 493
Exploratory Development	951
Advanced Development	1,007
Engineering Development	856
Management and Support	1,251
Operational Systems Development	3,408
Emergency Fund	125
TOTAL	\$8,091

Figure 1.

also being made to determine the best characteristics of an OTH system defense against the aircraft and submarine launched missile threat that might emerge in the 1970s.

• Some Advanced Technology.

Advanced technology work on penetration techniques is being performed in the Advanced Ballistic Missile Re-entry System (ABRES) program and the ARPA Defender program. The Defender program, for example, supports studies using a number of instrumentation radars at White Sands Missile Range and at Kwajalein. It also supports some exploratory efforts in decoy design and maneuvering reentry vehicle technology, although most of the previous penetration device work done by the Defender Program has been transferred to ABRES.

The Nike-X Development Program also contributes to offensive system evaluation; for example, by providing sophisticated techniques for flight test evaluation.

• The Threat from Communist China and U. S. Preparations.

Missile Threat: Communist China has not yet fired an ICBM-range test missile. Last year we anticipated that event might occur as early as the summer of 1967. Now we estimate it will not happen before the summer of this year and could precede an initial operating capability by about three to four years.

U. S. Preparations: The Sentinel program encompasses a straightforward, but difficult, engineering task, of completing the development and test of the Perimeter Acquisition Radar (PAR), the Missile Site Radar (MSR), the Spartan and Sprint missiles, and the associated data processing equipment. A development MSR is now being installed on Kwajalein; Spartans are being fabricated for flight tests. The PAR is under intensive design. A very large effort in computer programming remains to be accomplished. The Air Force and Navy will support the Sentinel system tests by launching ICBM targets. The FY 1969 funding requested for the Air Force and Navy target support is \$8 million and \$5 million, respectively.

In addition to the Sentinel work leading to operational deployment, we also support a substantial program

of advanced defense system work in the Nike-X development program. Its primary function is to develop components which could be introduced into Sentinel later. Total FY 1969 funding requested for the Nike-X development program is \$165 million.

Another program, the ARPA Defender effort, also does research and exploratory development in ballistic missile defense, including work on early warning, urban terminal defense, missile kill and vulnerability, and air defense. Important related ARPA Defender efforts are in the fields of interceptor technology, system studies, and laser technology. We are arranging the transfer of some of the appropriate ARPA activities to the Army Nike-X program now that we have made the Sentinel deployment decision. I will discuss this later. The requested FY 1969 funding for the total Defender program is \$103 million, of which some is expected to be transferred to the Army Sentinel Project.

Bomber Threat: The Chinese bomber threat is small and the Soviet bomber threat appears to be decreasing somewhat. Our bomber defense objectives are to deny damage from the Chinese and prevent the Soviets from having an alternative threat cheaper than missiles. However, current air defense systems permit intercept only a few hundred miles from the North American defense perimeter.

U. S. Preparations: As I have mentioned, we plan development and installation of an improved area air defense based on over-the-horizon radar and the Airborne Warning and Control System (AWACS), which is to be used also by our tactical forces. During the past year in the Overland Radar Technology program, preliminary tests successfully demonstrated the basic technological improvements which will make AWACS possible. Assuming continued success after a careful review, we will conduct contract definition on AWACS this year. FY 1969 funding is requested for AWACS.

To exploit this new AWACS capability, we must also upgrade our manned interceptors. Studies have shown that an improved F-106—incorporating AWACS, advanced fire control, and air-to-air missile—is superior in performance and far less costly (by almost tenfold) than any

other candidate interceptor system over a 10-year period. With this system, we will balance our defense, along with Sentinel, against both ballistic missiles and strategic bombers.

This spring we will review terminal bomber defenses, including an assessment of the relative utility of Hercules/Hawk and SAM-D in both the strategic and tactical roles. Studies have now been completed which define the improvements that could be made to Nike-Hercules to extend its lifetime. For the longer term we continue to pursue the advanced development effort on SAM-D. The past year has seen several significant achievements in this advanced surface-to-air missile effort.

• The Threat to Strategic Command and Control.

...The existing Defense Satellite Communications System, consisting of 19 satellites and about 30 terminals deployed world-wide, has clearly demonstrated the usefulness of satellite communications techniques in improving strategic command and control. The system has provided sustained communications supporting Southeast Asia and Seventh Fleet operations, as well as support to both Defense and State during the Israel-Arab conflict. In addition, it provides a previously unavailable capability: the transmission of high quality photographs in a matter of hours rather than days.

The FY 1969 funding request is directed to new, advanced terminals and satellites to provide increased system operational capabilities.

We are investigating the desirability of replacing or augmenting the current airborne command post aircraft with larger, longer endurance aircraft of the C-5 or 747 type. If the mission can be substantiated, these new aircraft might provide increased endurance and data processing capabilities.

Total R&D for an advanced airborne command post is estimated at up to \$100 million, depending upon the type and number of aircraft approved and the initial operating capability date selected.

A related supporting program is an Airborne Data Automation project which is testing air processing in existing command post operations, operating on a test base

Nuclear Effects and Nuclear Test Detection

These two programs are vitally important to the survivability and effectiveness of our strategic and general purpose forces. The nuclear effects programs determine the vulnerability/survivability of systems with a high degree of confidence. We have been actively engaged in research and development of nuclear effects simulators for laboratory and field use. Where simulation techniques are not satisfactory, we must also use underground nuclear tests to confirm the results of laboratory experiments.

In the nuclear test detection effort, we attempt to learn about the nuclear weapons programs and progress of potential adversaries. This is a major part of the work to estimate the nuclear threats which our systems would be expected to encounter and survive. These activities are a major fraction of the Defense Department contribution to the four Test Ban Treaty Safeguards. Figure 2 shows the programmed safeguards expenditure....

R&D Support of the War in Southeast Asia

Our initial budget for FY 1969 on currently identified R&D projects to support the war in Southeast Asia is about \$525 million. I estimate that by the end of the year the program will increase to about \$800 million to meet the special needs that probably will arise....

Counter-infiltration

Men and materiel infiltrated into South Vietnam provide critical help to the communist insurgency and the Viet Cong/North Vietnam Army main force activities. The major infiltration is by land. Infiltration by sea is not felt to be significant....

We have two major problems: detecting infiltrating personnel and vehicles along the many roads, trails, rivers and streams deep under jungle canopy; and effectively attacking these targets around the clock, in all weather conditions....

Neutralization of the VC/NVA Main Force Threat

A major mission of United States and allied forces in South Vietnam is searching for and destroying Viet

Cong/North Vietnam Army main force military units....

The major problems with search and destroy (S&D) operations are: the low probability of finding the enemy; once found, the inability to stay in contact; and the rapid gaining of fire superiority.

In almost every case where the enemy faces a superior force, they withdraw. Thus our effectiveness in terms of Viet Cong casualties inflicted is low. To improve our efficiency, primary emphasis must be placed on finding and fixing the enemy. Let me give two examples of current projects:

- An interesting innovation has been the Army's use of the "people sniffer" on a helicopter. Detections have been made under combat conditions; where it was possible to investigate, confirmations were made.

- To provide an improved night combat capability, the Army's Southeast Asia Night Operations program supports many efforts designed for field forces ranging from the individual soldier through airborne assault groups.

To minimize our casualties, which generally occur in the initial period of contact, we must rapidly gain firepower superiority. Today we are willing to expend large amounts of ordnance to overwhelm the enemy. Because of an inability to locate the

enemy precisely, this is an inefficient operation. As we improve our detection and localization capability, the improved firepower of new armed helicopters and better munitions will help save lives and reduce costs.

Let me now turn to another problem related to combatting the enemy main force threat: defense of our main military and logistic bases and outposts such as the Special Forces camps and temporary bases.... We must detect artillery mortars, and rockets (some mobile, some dug in) and then direct a killing fire.

Before leaving the subject of the so-called "in-country" war, let me discuss the problems in establishing our outposts and bases. This is an area that needs more imaginative attention. We would like to be able to rapidly emplace a base, either large or small, in areas where the enemy has some control. A good current example is our construction of strong points near the DMZ, to be used for observation and as bases for reconnaissance patrols. We should be able to draw on pre-fabrication technique for bunkers which can withstand mortar and artillery fire and use machinery for rapid emplacement of obstacle systems (barbed wire, minefields, watchtowers). I intend to emphasize these concepts with the Military Departments.

Department of Defense Program Supporting the Four Safeguards Related to the Test Ban Treaty

(TOA, \$ Millions)
(Fiscal Years)

Safeguard	1964	1965	1966	1967	1968	1969
1 Conduct of Underground Testing						
RDT&E (DASA)	10.9	21.2	37.7	39.9	37.8	42.9
2 Maintenance of Laboratory Facilities and Programs						
Sub-Total	55.1	55.8	56.8	53.6	61.0	60.3
3 Maintenance of Stand-by Atmospheric Test Capability						
Sub-Total	82.9	72.4	33.7	24.5	22.7	15.6
4 Monitoring of Sino-Soviet Activity						
Sub-Total	96.7	111.9	110.6	106.7	110.2	99.8
TOTAL	245.6	261.3	238.8	224.7	231.7	227.9

Figure 2

Air Interdiction Operations in North Vietnam

Our air operations against North Vietnam are intended to destroy the enemy transportation system and materiel flow supporting the battles in South Vietnam, and to exact a price for maintaining his forces in the South. Technically, our main problems in this mission are somewhat similar to those I have already discussed: target acquisition, and the accuracy and lethality of our weapons. There are also problems in getting to the target—including penetration of anti-aircraft artillery, surface-to-air missiles and aircraft defenses—and in aircraft survivability once engaged by the defenses. We need better ways to counter conventional anti-aircraft guns. The most promising countermeasures are improvements in achieving greater survivability for our aircraft.

The enemy air defense system as it stands, however, is a formidable threat. The greatest losses in the air war in North Vietnam are our well trained, experienced aircrews. Search and rescue efforts must be improved. I am concerned that our recovery rate of those rescueable aircrews have decreased. We have fielded a new

rescue vehicle, the HH-53B, which made its first recovery in late November. This aircraft, compared with the HH-3 which it will replace, has more speed and range capability, can hover out of ground effect, and has armor, a better suppressive fire capability, and better navigational aids. Yet this satisfies only a part of the problem of aircrew survivability and search and rescue. We must first assure that an airman can eject from a damaged aircraft and get safely to the ground. Then we must be able to locate and pick him up quickly. We are also studying and experimenting with more advanced rescue concepts such as mid-air snatch of pilots who have ejected. High priority work is also under way on better equipment for locating and communicating with downed aircrews.

One alternative to the use of tactical airpower along the coastal region, where many of the significant targets are located, is the use of naval gunfire. The Sea Dragon operation is already underway and will be significantly improved by the addition of a battleship in FY 1969.

Pacification

The pacification of South Vietnam is the goal of our operations in South Vietnam. . . . The DOD contributions

to pacification are designed to help isolate the Viet Cong from the populace, to provide security from the Viet Cong/North Vietnam Army main force threat, and to provide the local loyal populace with increasing security from the Viet Cong terrorist and guerrilla forces.

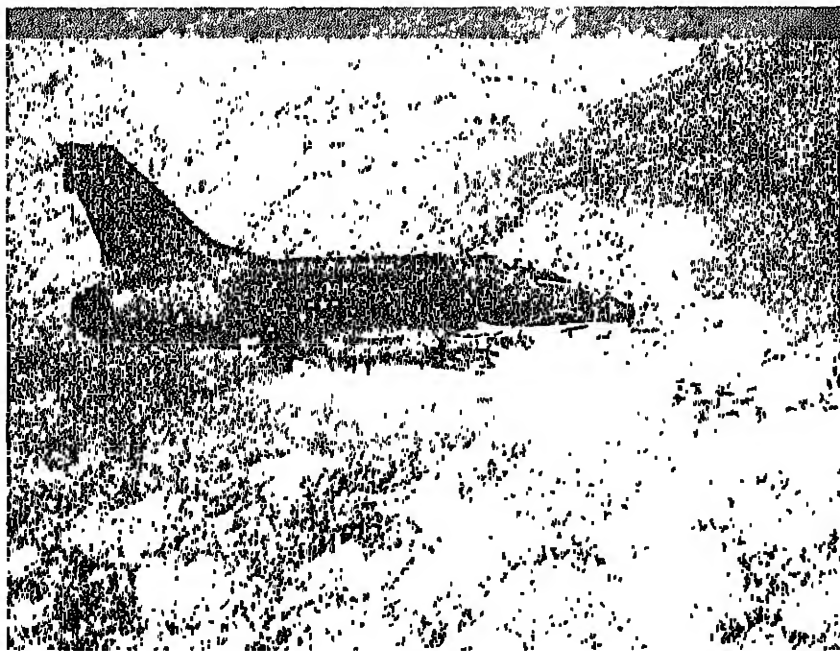
Our research and development programs to meet these goals include work in the Military Departments and in ARPA/AGILE. Studies involve the following: the design of a village and hamlet security system; communications systems improvements to give the lowest echelons of government more reliable means of obtaining assistance when attacked; and design of route security systems to keep Republic of Vietnam lines of communications open. These programs capitalize on the use of appropriate intrusion detection. They also give attention to the improvement of the Regional and Popular Forces largely responsible for local security. . . .

We have established computerized techniques for monitoring guerrilla incidents throughout the country and determining their trends. This provides a way to predict trouble spots—and a format for presenting current and predicted terrorist activity—that can be incorporated in a central local security intelligence system. This will add, at the village and hamlet security level, the capability for reporting, reacting to, and anticipating acts of Viet Cong violence and terrorism. The integrated local and route security efforts represent an important field for DOD research and development and will receive emphasis in FY 1969. Because the necessary technology and many of the needed components already are available, we hope to test a new approach in these activities on a pilot basis in Vietnam during FY 1969.

Another important part of the DOD role in pacification is in the psychological operations of American and Vietnamese forces. Research efforts to develop information necessary for planning sound programs to encourage Viet Cong defection and to increase local support for the government of Vietnam have been started and will continue in FY 1969. . . .

Tactical Forces

The purpose of our research and development in tactical warfare is to provide the technical capabilities



A U.S. Air Force F-100 Supersabre pilot fires folding-fin rockets into an enemy position during a mission over South Vietnam.

needed for U.S. forces to meet a range of possible conflicts, short of a major strategic war, with measured, effective responses. The spectrum of conflict includes guerrilla warfare and counterinsurgency operations (such as in South Vietnam), essentially conventional wars against more sophisticated and mechanized forces (such as we saw in the recent Middle East conflict and in Korea), wars on the seas, and wars involving the possible use of tactical nuclear weapons.

Two basic guidelines apply to this area (as well as to other parts of the R&D program):

- Develop those improved and new capabilities necessary to maintain a technical edge over technologically sophisticated potential enemies.

- Emphasize development of those new systems required to deter—and when necessary, to win—limited wars.

This area of work, while coupled to the special needs emerging from Vietnam, will continue to meet the many broad needs of our general purpose forces, no matter how quickly the war in Vietnam can be terminated.

In the following discussion, I will review our R&D program in the major categories of air, land and sea warfare and airlift.

Air Warfare

... With recently acquired Overland Radar Technology (ORT) data, we are ready to proceed with contract definition for Airborne Warning and Control System (AWACS) in FY 1968 and, assuming continued progress, with development in FY 1969. I am requesting funds in FY 1969 to start development of a system that should satisfy both Air Defense Command (ADC) and the Tactical Air Command (TAC) requirements. AWACS will be used by TAC as a self-contained airborne supplement to the Tactical Air Control System.

We are continuing the development of follow-on versions of Standard ARM in FY 1969 as well as basic more

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rate navigation to the target and about the location of the target under adverse weather conditions and/or at night, as well as increased weapon delivery accuracy. Although these needs are certainly not new, recent technological advances permit the development of significantly improved capabilities. . . .

The introduction of the F-111/MK II into the inventory should provide an improvement in radar bombing accuracy over the F-111A. . . . Funds will be required in FY 1969 to continue the MK II development program.

Similar avionics for the A-7D/E are expected to provide improvement in navigation and weapon delivery accuracy, compared with A-7A. Development of the A-7D/E, which was initiated in FY 1967, will be completed in FY 1969. Test and evaluation will continue into FY 1970.

As the larger aircraft-induced weapon delivery errors are reduced, ordnance characteristics begin to limit weapon delivery capability. Ordnance improvements include the development of reduced-drag stores, the decrease of weapon overheating at supersonic speeds, and a tighter control of ballistic coefficients. Weapon lethality will be increased through development of an improved family of general purpose bombs with greater penetration against hard targets and better fragmentation against area targets. The development of tactical nuclear bombs and standoff missile warheads is being continued to provide further improvement in yield-to-weight ratios.

Guided standoff air-to-ground missiles are another means for precise ordnance delivery. Clearly, the trade-off here is reducing aircraft exposure, and attrition in exchange for higher ordnance cost. We are continuing the development of the Condor and Maverick.

Armed Reconnaissance Mission: The principal problems in armed reconnaissance are: finding transitory targets and hitting them. Research and development to improve our capability focuses on the development and application of sensors for night and all-weather detection of targets, and the development of ordnance optimized for use against particular kinds of targets.

Trains, truck convoys, troop concentrations, command centers, surface-

to-air missile batteries and storage facilities are typical armed reconnaissance mission targets. These targets are mobile or transportable, or can be camouflaged effectively when stationary.

Radar technology offers the greatest promise for development of the all-weather capability, and for equipment suited to high-speed strike aircraft (F-4, F-111). The recent advances in microcircuitry, solid state transmitter developments, and steerable array antennas provide the basis for development of new, relatively small, highly reliable and maintainable systems. These systems may offer the improved mapping resolution and moving target indication (MTI) needed for the blind attack of prominent fixed and moving radar targets. We plan further development of critical components, and the extension of digital data processing techniques to attain this capability. In FY 1969, \$10 million are programmed for this activity.

Longer-range projects to be initiated in FY 1969 are: a major air-to-ground gun development program with rounds optimized for specific categories of targets, considering the full spectrum of available munitions; and a fuze program to develop improved proximity fuzes, delay fuzes and mine-type fuzes for general purpose bombs.

Close Air Support. Close air support missions are conducted under the direct control of forward air controller (FAC) aircraft and forward ground observers, using target markers, ground based weapon control systems and beacons. The cooperative functioning of controllers and strike aircraft requires communication between Army, Air Force, Navy and Marine units both at the field unit level and at higher levels of command. These communications needs require the development of a short-range squad radio (which does not interfere with the normal activities of the user), and of special light-weight communication equipment for the forward air controller. An airborne near-line-of-sight relay (both manned and unmanned and having greater channel capacity and increased frequency coverage) is being developed to extend the range of battlefield communications. I am requesting funds in FY 1969 for these activities. . . .

The previously discussed A-7D/E—with its substantial loiter time and payload and improved avionics—will provide an excellent close support capability in addition to a long-range interdiction capability. We are also conducting concept formulation studies for a possible new aircraft, the A-X, designed for the close support mission. We are presently examining the relative merits of a simple, inexpensive close support aircraft to augment immediately A-7 and AT-37 forces versus a sophisticated aircraft for A-7 replacement in the mid-1970s. We are providing funds in FY 1969 to continue concept formulation and initiate advanced technology programs. The funding plan contemplates contract definition in FY 1971 for the A-7 replacement system. The Air Force will submit a concept formulation package for the alternate, quick-reaction A-X in FY 1969.

Air Superiority Mission. . . . Tactical aircraft studies conducted in FY 1968 have established the need for improved fighter aircraft (FX/VFAX) in the mid-1970s to perform the escort and air defense missions currently assigned to the F-4 and the F-8. We are requesting funds in FY 1969 to proceed with aircraft designs and preliminary work on the avionics and the engine.

Along with the FX/VFAX airframe development, a need exists for improved air-to-air missiles and high-rate-of-fire guns. Two new advanced development programs were initiated in FY 1968, for which funds are requested.

Land Warfare

Because our tactical doctrine has always emphasized offensive combat operations, I will discuss our land warfare RD in that orientation. But remember that the same equipment is used in defensive or delaying type operations.

Offensive Combat Operations. The essential elements of offensive combat operations are, of course, to find, to fix, and to destroy the enemy.

Battlefield Surveillance and Target Location. Clearly, our first problem is to find the enemy, to locate the targets which we must attack. In my earlier discussion, I mentioned several target location programs for immediate application to Vietnam. In addition to these, we are engaged in advanced development efforts on sensors to extend the reconnaissance capabilities of our ground forces. For FY 1969, support is requested for these broader, longer-range activities.

Ground forces employ reconnaissance scout vehicles in target location

operations. Our current vehicle, the M-114, does not provide the desired cross-country speed, mobility and quietness of operation. To overcome the shortcomings of our present equipment, we are conducting concept formulation studies for a new armored reconnaissance scout vehicle. In FY 1969 \$3.3 million is requested. We expect to achieve a significant increase in adverse terrain mobility and quietness of operation.

Fixing the Enemy. Once the enemy is located, firepower and mobility are employed to maneuver our forces into a tactically advantageous position. The conventional firepower is provided by artillery weapons.

To provide the required increases in range and mobility for armored warfare, a self-propelled 155mm howitzer is being developed as a general support weapon for the infantry and armored divisions. Contract definition on this weapon, the XM-138, is planned for FY 1969. This weapon will have mobility consistent with MBT-70 equipped forces. We are also considering an armored version of this weapon, the XM-179. The R&D cost for the XM-138 is \$3 million in FY 1969.

To meet the longer-range needs of airmobile operations such as those in Southeast Asia, we are performing concept formulation efforts on a rapid fire, lightweight 105mm howitzer system.

An important step toward better field artillery utilization occurred in FY 1968 with the initiation of the TACFIRE program. TACFIRE will apply automatic data processing, storage, and display techniques to the tactical and technical functions of field artillery at all echelons from battalion through corps. TACFIRE should improve the accuracy, timeliness of response, and ability to mass fires. Higher intensity conflicts may demand delivery of ordnance at greater than conventional artillery ranges. Tactical surface-to-surface missiles are being developed for this role.

The Lance was originally designed for targets to a range of 75km carrying either a nuclear or non-nuclear warhead. Development of an Extended Range Version (XRL) was initiated in FY 1967. A recent comparison of Lance and XRL effective-



Troops of the U.S. First Infantry Division take cover from sniper fire during bitter fighting at An My, 42 miles northwest of Saigon.

ness produced the conclusion that only the XRL should be fielded. FY 1969 funding is requested for continued development of the XRL.

The Pershing missile system is presently deployed on a quick-reaction alert in support of NATO. . . . Funds are requested to complete the engineering service tests on the wheeled version of Pershing.

. . . We may enter contract definition of the Mechanized Infantry Combat Vehicle (MICV-70) in FY 1969. This vehicle will provide increased armor protection and have mobility compatible with MBT-70-equipped forces. Four million dollars is requested for this in FY 1969.

The Main Battle Tank (MBT-70) is being developed to provide the heavy armor capability for the mid-1970s. . . . During the past year, we rescheduled this program, and reduced concurrency between development and production. A new goal of production has been established. The cost is consistent with the program plan, and recognizes the financial implications of concurrent U.S. and Federal Republic of Germany efforts. In FY 1969, this program will require \$37.9 million.

The development of small, effective anti-tank missiles has provided our forces with a way to combat enemy armor. Because such missiles could be used against our tanks, we are studying appropriate countermeasures. The three anti-tank missiles in our inventory and in development are the Shillelagh, the TOW, and the Dragon. . . . Funds are requested in FY 1969 to complete engineering and service tests. The Dragon is a man-portable, wire-guided missile now in operational systems development. . . . To complete development of this item, \$15 million is requested in FY 1969.

. . . To provide the next generation of helicopters for tactical mobility, we plan to carry out concept formulation on the utility tactical transport (UTT) for squad lift, and on the light tactical transport (LTT) for platoon lift. These are planned to replace the UH-1D and the CH-47 helicopters in our current inventory. . . . During FY 1969, \$2.3 million is needed for this concept formulation work.

The UTT and LTT will receive enroute protection, reconnaissance support, and suppressive fire support

for debarkation/embarkation from the AH-56A, which was committed for production in FY 1968. . . . In FY 1969 \$25.4 million is requested for this system.

Final Destruction of the Enemy. To accomplish the final destruction of the enemy, the rifle, pistol, machine gun and grenade come into play. Recognizing the recent small arms developments that have come from industry, we plan to change our procedures to capitalize on this growing industrial capability and interest. Starting in FY 1969, we will restructure our programs and put a substantial portion of exploratory and advanced development funds for small arms on contract.

One of the candidates for a follow-on is a projectile that promises to increase the lethality and hit probability of small arms fire. Its potential advantages—in terms of improved combat effectiveness, reliability, and consequent reduction of personnel casualties—warrant continued vigorous development. For FY 1969, \$16.3 million are requested for work on small arms.

Some of our most important, though relatively inexpensive, activities are in the development of personal equipments, lightweight armor, and food items for the soldier.

Special Developments for Defensive and Delaying Operations. By simply changing tactics and methods of employment, the weapons and equipments that I have described are applicable to defensive operations. . . .

For high value targets, we can afford to use our sophisticated defensive systems (Hawk and SAM-D). The Hawk improvement program will enhance that system's capability. For the long term, as a defense against F-111 type aircraft and tactical ballistic missiles, we are continuing the advanced development of the SAM-D system.

The next element of our air defense system, applicable at the division level and higher, is Vulcan/Chaparral. In FY 1969 \$9 million are requested to complete this development.

Redeye is an air defense weapon for use by forward echelons in the field Army area. . . . We are continuing to study methods for improvement of the Redeye. Our plan is to initiate an improvement program, as feasible and required, in FY 1970.

Combat Support and Service Support Activities. Our combat support activities, though not always glamorous, are critical and also require R&D effort. . . . In FY 1969 \$1.5 million is requested for development of the XM-705.

Communications obviously is an important combat support activity. We are upgrading the security of all tactical circuits for both voice and digital information. Various means of elevating antennas above the foliage (such as balloons and portable towers) are being developed to extend combat communications range. Survival communication for aviation personnel is being provided with improved location devices.

To replace the manual system in the field army area, Project Mallard was initiated in FY 1967 as a joint U.S.-British-Canadian-Australian project. Funds are requested for this project in FY 1969.

A completely mobile radio communications system (RADA) that provides subscriber-to-subscriber communications throughout the division area much like that of a dial telephone, but without wire, is in advanced development and may form the single channel access to the Mallard system. In FY 1969 funds are requested for this program.

During 1968-1969, the three Military Departments—jointly participating in the Tactical Satellite Communications (TACSATCOM) Program—will conduct experiments on the feasibility of using space repeaters for medium- and long-range tactical communications. . . . A limited initial operating capability to respond to certain emergency situations could be available by the end of 1968.

Combat service support activities provide the POL distribution and dispensing equipments, the specialized earth moving equipment, prefabricated airfield surfaces, cargo handling and terminal equipment. All of this permits a high level of close air support. Another group of projects in this area includes the field medical equipment and hospital system (MUST) that, coupled with helicopter evacuation, have provided our combat soldiers with a greatly increased probability of survival. For these combat support R&D activities I have requested \$15 million in FY 1969.

Sea Warfare

Sea warfare may involve: the projection of U.S. power overseas; the control of vital sea areas; the destruction of enemy naval attack of enemy areas from the sea; and the protection of friendly military and merchant shipping from attack by air, from the surface, or from submarines. . . .

Naval air warfare R&D for the attack carrier striking force was discussed previously. The remaining discussion of R&D for sea warfare will be limited to anti-submarine warfare and the air defense of sea-borne forces, the conduct of amphibious operations, and the development of marine technology and advanced logistics techniques.

Anti-Submarine Warfare. . . . We are starting efforts to reduce the vulnerability of our systems to countermeasures. Anti-submarine (ASW) and anti-air warfare (AAW) systems are being developed to protect our naval forces and shipping from attack by the serious threat of the submarine-launched cruise missile.

Our air ASW capability and the qualitative superiority of our submarines are being improved with development of a new torpedo, the MK 48. We are beginning development of an ocean-wide ASW command and

control system; and developing new escorts (DX), as well as improved sensors, weapons, and command and control systems for our escorts. The ASW R&D request totals \$384 million.

Airborne ASW. The decision to develop the VSX—a new carrier based ASW aircraft—is a major highlight of our FY 1969 program. . . . I am requesting funds to carry out engineering development of the engine and avionics, and to conduct contract definition. The total R&D cost is expected to be \$450 million.

Airborne ASW programs of the last few years have developed an intra-aircraft command and control system (A-NEW) for the landbased ASW aircraft, the P-3; and the DI-FAR sonobuoy and signal processing system. Both systems will provide a significant increase in air ASW effectiveness.

To support the P-3C/VSX programs, and to improve sensors and integrated avionics systems for future air ASW systems, the advanced ASW detection program includes a number of projects, for which funds are requested.

Submarine Systems. For the submarine's ASW role, R&D programs emphasize improving sonar, torpedoes, and communications. We have been working on the development of

an improved torpedo since 1964, and expanded the program in FY 1967. Because of the importance of this weapon to the submarine force, we are conducting two competitive development activities.

We are also developing sonar improvements for submarines now in the Fleet. These are short-term improvements using available technology and will provide an early increase in capability. In addition, funds are requested for FY 1969 for advanced development of a new submarine sonar system, with the goal of entering contract definition in FY 1970. A request for \$1 million is also included for a sonar for the AGSS Dolphin.

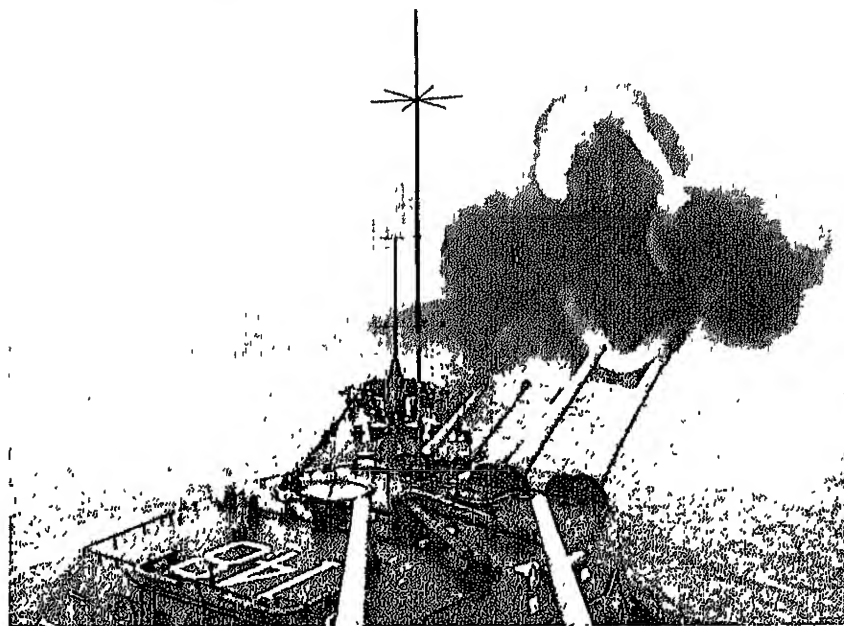
Surface Ship ASW Systems. Surface ship ASW systems must be improved to cope with the known steadily increasing capabilities of submarines. We are developing Extended Range ASROC and a command and control system for intra- and inter-ship use to improve coordinated ASW operations.

In contrast to air and land warfare, a large portion of sea warfare expenditures do not fall in the R&D budget because ship construction is largely funded through shipbuilding and conversion (Navy) funds. We are, however, supporting the Navy's urgently needed escort replacement program, DX/DXGN. Because our existing escorts are aging rapidly, and it appears neither prudent nor economical to spend millions of dollars to modernize them, the Secretary of Defense is requesting five DXs in FY 1969. The recent indications of Soviet naval expansion and movements to far-flung geographic locations strengthens our requirement to maintain a strong escort force.

Anti-Air Warfare. In anti-air warfare, the objective of the R&D effort is to provide improved sensors and weapons to enable the Navy to defend itself successfully against the enemy air threat. . . . A total of \$19 million is planned for the basic and advanced point defense systems.

The Advanced Surface Missile System is now entering contract definition. We request funds in FY 1969 to start engineering development.

Communications. In the area of shipboard communications, we are solving several problems. Operations in Southeast Asia and simulated fleet exercises, such as BASELINE, have highlighted the large increase in mes-



The eight-inch guns of the heavy cruiser USS Newport News (CA-148) are fired by crewmembers in a display of naval fire power. Newport News was among the Seventh Fleet ships which participated in Operation Sea Dragon, patrolling the North Vietnam coastline around the clock.

sage traffic, and the needs for more rapid response time in internal command and control, broader inter-force circuit ties for joint operations, and greater circuit flexibility in external communications. To meet these needs, message distribution and circuit control will be automated; monitor and test functions will be provided; and equipment of higher reliability will be developed. These steps also will reduce the likelihood of manual error and reduce the manpower costs for these support functions. The eventual introduction of reliable satellite communication terminals aboard major ships should markedly reduce the transmission problem. As security is added, anti-jam capability must be emphasized on all future vital circuits.

Funds are requested for this advanced communication work in FY 1969. This work was initiated in FY 1968 and will require additional funds by 1972 to complete advanced development.

Amphibious Warfare. This field of warfare encompasses a broad spectrum of sea warfare forces, including small craft, vehicles, ships and weapons. New boat hull designs and propulsion systems are being investigated for landing craft, and a new amphibian, the LVTPX12, has been developed to replace the current amphibian, LVTP5A, which by 1971 will be beyond economical repair. . . . Total R&D cost of the LVTPX12 is estimated at \$25.1 million, including \$2.4 million in FY 1969 to develop ancillary versions.

The Marines need long-range shore bombardment support before and during amphibious operations. The Landing Force Support Weapon (LFSW) is in concept formulation for this purpose. The Lance missile also has the potential to meet this need and is cheaper; however, it must be tested in a sea environment. Funds are requested to complete feasibility tests and concept formulation of LFSW and this application of Lance.

Concept formulation is also under way on a Landing Fire Support (LFS) ship which will provide major caliber bombardment capability for amphibious assault landings. We plan to complete concept formulation and commence contract definition in FY 1969 leading to LFS ship procurement in FY 1970. FY 1969 funding request is \$20 million.

In amphibious shipping, we are developing the LHA, a landing ship that for the first time will transport a complete fighting unit (troops, weapons, vehicles, and helicopters). . . . Contract definition is completed, and engineering development will start with shipbuilding and conversion (Navy) funds in FY 1969.

Other Sea Warfare Programs. Marine Engineering and Technology addresses the development and improvement of shipboard propulsion systems and machinery, hull design and structural improvements, the development of advanced surface craft, ship concept formulation and computerized ship design, submarine safety, damage control and fire prevention, and the Deep Submergence Program. The planned effort provides the capability to correct deficiencies causing serious engineering maintenance and repair problems in the Fleet. It also provides the basis for developing new techniques and concepts for both new construction and future classes of naval vessels.

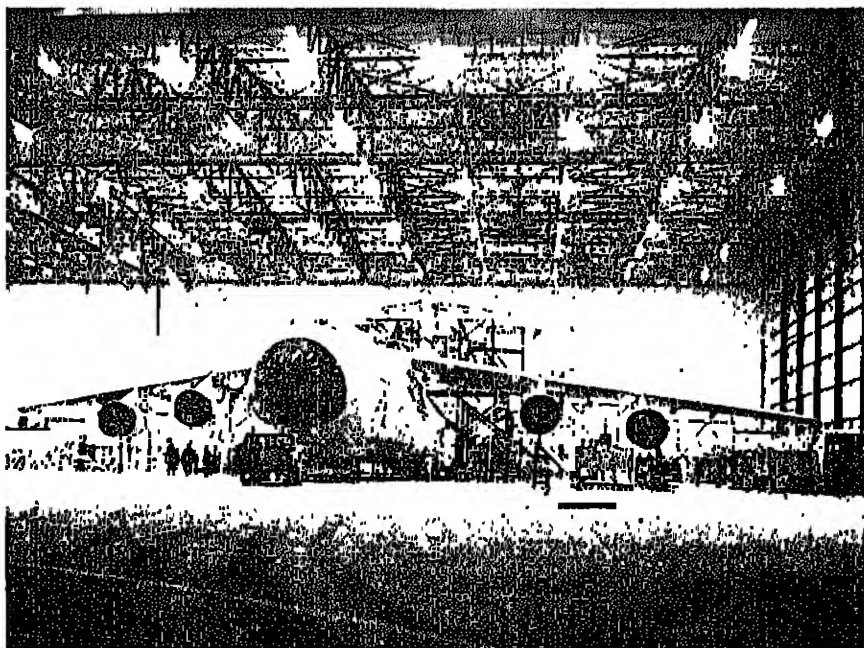
A program which subjects all major new ship designs to the concept formulation/contract definition procedure has been started. The FDL, LHA, MCS, LFS, and DX/DXG type ships are in the process in FY 1969. Previous year funding of this work was in shipbuilding and con-

version (Navy); in FY 1968 the shift of accounting to RDT&E funding began. The Deep Submergence program is a \$25 million effort which develops vehicles and technology for personnel rescue from submarines, deep ocean search and salvage, ocean engineering, new diving techniques, and man-in-the-sea capability. We conduct advanced logistics support programs that cover a spectrum from exploratory development of concepts and equipments for facilities, personnel and advance base support, as well as the control, distribution and storage of material, improved systems for aircraft rearming, ship replenishment, Marine Corps logistics, and logistics management. FY 1969 funding request is \$12 million.

Airlift

The ability to rapidly transport troops and equipment is an essential element of modern military tactics and strategy. The C-5A aircraft, which is progressing according to plan, will provide the necessary strategic mobility. . . . Funding of \$128 million is requested in FY 1969 for the fourth year of full-scale development.

The Air Force has proposed development of a new intra-theater transport aircraft (LIT) to replace the current tactical airlift aircraft



A giant U.S. Air Force C-5A Galaxy, the World's largest aircraft, in the Lockheed-Georgia Co. cantilevered hanger. The new engineering test center, located in Marietta, Ga., was the site of the C-5A rollout on March 2, 1968.

(C-7, C-123 and C-130) in the mid-1970s. . .

. . . Concept formulation studies are being conducted to define the LIT need. I expect these studies to be completed in late spring, and am requesting funds to preserve the option to initiate contract definition in FY 1969.

V/STOL aircraft, helicopters and hybrid helicopter-aircraft research and development activities are being conducted to provide a firm technological base from which to make a choice in fulfilling future requirements. Survivability in forward areas was recognized as a major problem in FY 1968, leading to concept formulation on less vulnerable systems, the Utility Tactical Transport (UTT) and the Light Tactical Transport (LTT) as replacements for the UH-1D and CH-47. The development of a composite aircraft (CAP) based on the stopped or stowed rotor concept was also considered. CAP development is not being implemented because of the higher priority need for the UTT and LTT.

Research and Technology Base

Introduction—General Assessment

A lesson reinforced over and over throughout history, especially in our era, is that science and engineering continuously make possible completely new military capabilities and threats. National security today—understood broadly and deeply—is more directly linked than ever before to the practice of first rank science and engineering. We have a strong technical-military position today only because we built a strong research and technology base in the past. We must maintain this position. . .

Research and Exploratory Development Goals. Research and exploratory development are aimed at the future. It may be 10 years or more before a significant result from research is incorporated into an operational system. Similarly, it may be five years or more before a missile structural material proven feasible in exploratory development is used in a significant number of deployed missiles. However, we maintain perspective, and a consistent framework, by adhering to five general, continuing goals which are applicable to both

research and exploratory development. I will state and illustrate each of these.

- To discover and understand scientific phenomena and technological processes relevant to long-term national security. This leads us to support academic research (and some graduate education), industrial research, and in-house laboratory research necessary to extend the frontiers of defense science and technology. For example, our molecular beam research—conducted primarily in university laboratories 10 years ago—led to “pumping” atomic systems to excited states. This concept led to laser devices.

- To define the phenomenological and technological limits to weapon capability, both our own and our adversaries. During the past few years we have been able to reduce the weight of rocket motor cases to the point where they represent only a small percent of the total weight. Materials science might well give further reductions in motor case weight, but we have reached a point of diminishing return. Further reduction in motor weight would not give increased range or payload commensurate with the R&D cost.

- To preclude technological surprise by others and to provide the basis for disclosed capabilities of our own. As always in combat, we have disclosed some of our military capability in Vietnam. For example, we have demonstrated our electronic countermeasures against ground-to-air missiles. Thus we must extend our inventory to new effectiveness levels. Furthermore, one must try to go all the way to the frontiers of knowledge and technology to prevent surprise. Going most of the way isn't enough, because the new and surprising may be found beyond that point.

- To maintain an “on-call” technological ability to deal with problems posed by the innovations of others so that we can respond rapidly and flexibly during crisis. For example, one of our technological options to the Soviet deployment of ABMs is to put a number of independently targeted warheads in each missile, the so-called MIRV (Multiple Independent Re-entry Vehicles) system. Not all problems have technological solutions, but by providing the greatest number of technological options we enhance the ability of the United

States to adopt in minimum time a course consistent with national strategy.

- To develop new materials, techniques and processes which allow us to increase the maintainability and reliability of operational systems, thus reducing total system cost.

In managing our technology base, we insist upon two primary characteristics: projects must be responsive and relevant to genuine defense goals, and coupled and integrated wherever feasible with the anticipated needs of advanced and engineering development programs.

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Research

Before I review the details of our research program, there are two general topics which I should discuss: the unique requirements of DOD in research, the the relationship between defense research and the academic community.

There are many examples of DOD research programs which have led to both a vital defense capability and a valuable innovation in American industry. Perhaps the computer is the best example. However, the facts that the computer has been widely accepted in industry, and that there is now much private financing of computer research and development, do not mean that DOD should not have funded the original developments. Nor do these recent events mean that DOD should not now support critically needed, specific advances in computer capability.

An example of the opposite situation is the field of high energy physics. Formerly we funded a significant amount of research in this area. Today, having gained much relevant knowledge, we are phasing out our support of high energy physics, and we have coordinated with the National Science Foundation to continue the program. We do plan to continue only a few technological projects closely related to defined DOD interests.

It is relatively easy to find one to two hundred innovations due to recent research (or exploratory development) in a major weapon system. Studies have shown that, on the average, about 86 percent were funded directly by DOD and another nine percent by defense industry through profits or independent

R&D. Only five percent came from non-DOD sources. We are convinced that the only efficient route to obtaining the innovations necessary to preserve national security is DOD's direct support of work in areas known to be relevant to DOD.

The general point is that research is indispensable to the DOD mission, though the specific areas of needed research may vary during a period of a few years. All areas are regularly reviewed, with each area judged on its own merits in relation to current priorities.

There is, of course, an attendant responsibility to avoid unnecessary duplication and to seek out co-operative areas with other Federal agencies. Throughout the research activities of the Military Departments and the Advanced Research Projects Agency, there is close liaison—structured by both formal and informal agreements and administrative links—with other R&D components of the Government. For example, the Aeronautics and Astronautics Coordinating Board (AACB) is the vehicle for DOD-NASA coordination. Panels of the AACB coordinate projects in propulsion, launch vehicles, instrumentation, life sciences, materials, support systems in the space environment and others.

Let me turn now to our interactions with the educational process. There is a fundamental relationship between research, the advance of science and technology, and graduate education in science, engineering and medicine. We are apt to think of college education as a process of completing a certain number of courses. This is true for the bachelor degree, but graduate education is quite different. While there is formal course work, the essence of the graduate educational process is the student's research and close collaboration with faculty. Research skills today are developed through the guidance and leadership of a senior scientist who is himself working at the frontier of knowledge.

Thus, when DOD places a contract at a university, we fulfill two of the goals I outlined earlier. First and most important, we reach our principal goal—new scientific knowledge relevant to defense needs. Second, in reaching this goal, we automatically provide the indispensable resources for the research training of

graduate students, many of whom will become the staff in laboratories, industry, Federal Contract Research Centers, and academic research groups working on defense problems. The main point is that the two are inseparable: sponsoring research at universities, rather than detracting from the educational process, provides superior graduate education, though graduate education support *per se* is, of course, not a DOD goal. . . .

Research Objectives. I have listed five broad goals which guide our research and technology effort. There are two primary objectives applicable to the research segment:

- To work at the limits of knowledge of natural phenomena, and to extend these limits so that we develop a more complete understanding of the fields of science relevant to national security.

- To determine the physical limits of various fields upon which our weapon systems are designed. These provide the ultimate goals for our systems. In addition, because the Soviet and Chinese regimes are based upon closed societies, we often estimate their best potential capability through a careful scientific analysis of the limits to which any given system might be carried.

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Future Opportunities. Those in the past who have tried to predict the future of science have usually been far too conservative. For example, one technical forecast in 1937 missed computers, atomic energy, antibiotics, radar and jet propulsion. Yet all of these were incorporated in successful systems within a few years after the forecast. In research, one discovery often interacts with and leads to many others, frequently in fields far from that in which the original advance was made. Therefore, rather than predict, let me briefly review some of our plans for research in areas fertile for future defense needs.

We have ARPA programs in parallel processing and in advanced computer languages. Other research is directed toward better input-output devices and improved man-machine communication. In the field of mathematics, the so-called fast Fourier transform has been developed which should in many cases reduce computational effort by a factor of 1,000 or more, and research in the calculus

of variations and in matrix operations should also lead to better, faster computational procedures.

It is, of course, impossible for us to do all of the research needed in any given area. Computers are a good example if only because there has been fantastic progress in the field: it has been estimated that computers have increased in capability at least tenfold every five years. So, one might ask, is it necessary for DOD to perform research in computers and information processing? Why not just wait until the requisite capability emerges from the research done elsewhere? Let me give you three main reasons. First, DOD is the largest user of highly advanced computers in the world. Second, DOD requires unique capabilities such as extreme reliability, great ruggedization, very large systems, and real-time communication between systems. Third, in many areas, the greatest economy and effectiveness of other military developments can only be achieved if certain computer research is pursued as soon as it is recognized by DOD. Thus, we must continue selective programs in this vital area.

Another important field of opportunity is lasers, which offers great promise in the field of communications. Because the frequency of visible light is so much greater than microwave, a laser system can accommodate vastly greater information, and offers increased security in transmission. Accordingly, we plan to devote considerable research to lasers generally.

Through THEMIS we are developing new and relevant research findings while providing special opportunities to universities which have had relatively little past participation in defense-related research. In instituting the program in FY 1967, 173 universities and colleges submitted 483 separate proposals in scientific areas of interest to DOD. Forty-nine THEMIS research centers were selected at 42 institutions representing 31 states. For FY 1968 we have received 413 proposals from 139 institutions, and expect to select approximately 40-50 additional centers.

The FY 1969 request is \$36 million to sustain the first 90-100 academic centers, and to start a third group of 40-50 centers. . . .

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Recommended Budget for Research. I have reviewed in detail the various programs and projects which constitute our research fund request. Accordingly, in FY 1969 I am recommending an increase in our Defense Research (RDT&E) to a total of \$450 million. . . .

Exploratory Development

I want to turn now to exploratory development, the other segment of our research and technology base, which is the vehicle for determining the technical feasibility of new findings and inventions. . . .

Specific Exploratory Development Goals. Just as research has its appropriate specific goals, our exploratory development projects are designed to satisfy four primary objectives. I will state each of the objectives, and illustrate each with an effort that has already been completed.

- Provide higher reliability devices for communication, detection, navigation and guidance. For example: satellite-assisted battlefield communication and navigation systems, and jungle radio communication systems.

- Decrease combat vulnerability of both men and equipment, and provide superior resuscitation and support for casualties. Examples include: improved helicopter and individual armor, and long storage life frozen blood for transfusion.

- Increase the effectiveness of existing weapons, often thus reducing logistic load and providing our forces with marked superiority. For example: beehive ammunition, and helicopter fire systems.

- Reduce operational costs, at constant levels of effectiveness. There are a host of these including plastic mortar and artillery shipping containers, improved medical care such as through anti-malarial drugs, improved patrol and survival ration kits, and computer applications to logistic, personnel and intelligence operations.

Throughout all of this effort, of course, the underlying aim is simply a good new idea that can give our forces a qualitative military advantage.

* * * *

Future Opportunities. There isn't enough time to outline our entire future technology program for a com-

plete description would require at least a hundred pages. However, there are many exciting technical opportunities in most areas of military need. Not all of these will be followed up by DOD. Industry is constantly generating new technology, but there are areas where DOD must participate because of unique needs or the lack of sufficient market to rely on speculative development by industry or for other reasons. Again, I will give you a few examples:

In computer technology we will follow-up and consolidate basic advances in both software and hardware. For example, we foresee computer-controlled instructional systems, intelligence analysis, new missile intercept and discrimination calculations to allow more accurate and rapid processing of multiple warhead problems, ruggedized devices for tactical applications, and even lower powered computers for missiles and space vehicles.

In communications, developments are under way on input and output devices utilizing solid state electronics to replace present, more complex, less reliable electromechanical techniques. As an example, we visualize a two-thirds reduction in the volume of teletypewriters. Laser communication techniques, improved methods for underwater communications, and new digital techniques for greatly expanded battlefield communication systems are also in our program.

In materials technology, there are new materials for solid-state electronics, for lasers, and for new superconducting devices. Composites, plastics and ceramics will continue to replace metals for many purposes including armor, aircraft and missile structures, and vehicle parts. For deep submarines, we expect over the next few years to be able to explore twice the area or carry twice the payload in very deep ocean exploration. The technology to make transparent ceramic armor capable of stopping .50 caliber armor piercing rounds will be extended. Made of crystalline oxides of aluminum and magnesium, these will form windows and windshields for helicopters, light aircraft and armored vehicles.

In conventional ordnance we should realize very small and inexpensive (perhaps one-tenth the cost) proximity fuzes for artillery and air-to-ground attack to small targets such as trucks and tanks.

Intensive effort will continue to go into the problems revealed by the conflict in Southeast Asia. For example, as I have mentioned earlier, we urgently need still better night vision devices, personnel and ambush detectors, detectors for land and river mines, and non-flammable fuel and hydraulic systems for aircraft of all types. . . .

Proposed Budget for Exploratory Development. We have reviewed the programs one by one, tried to relate their cost to our defense needs, and have totaled the funds for necessary activities. As a result, I am recommending funding of \$980 million (RDT&E) in exploratory development for FY 1969, essentially the level proposed for FY 1968. . . .

The Advanced Research Projects Agency (ARPA)

I have already mentioned various and exploratory development results in which ARPA has played a major role, particularly in ballistic missiles defense and penetration aids, nuclear test detection, and R&D for Vietnam. We have been restating ARPA's role and emphasizing the management concepts necessary for ARPA to continue to respond promptly to our R&D needs and opportunities. . . .

As you know, ARPA was established in February 1958 in response to a need for centralized management of selected, high-priority projects. ARPA has been an extremely effective way to handle R&D projects that are:

- Multi-Service in nature or at inter-Service boundaries, such as counterinsurgency, information processing techniques, and advanced sensor concepts.

- Clearly important to DOD but in areas where Service missions are not yet clear, such as the initial work in advanced ballistic missile defense concepts and nuclear test detection and countermeasures.

- Especially quick-reaction R&D needs, such as for Vietnam.

ARPA's projects are often relatively short-term. They are carried to a certain stage in research or exploratory development, and then transferred to an appropriate Service. . . .

Our FY 1969 budget request for ARPA totals \$244.7 million. This includes \$53.6 million for research and \$191.1 million for exploratory development.

Benefits of Early USATECOM Involvement in Missile Developmental Testing

Lieutenant Colonel Phillip H. Donahue, USA

The U.S. Army Test and Evaluation Command (USATECOM), as part of the Army Materiel Command, conducts independent testing of materiel undergoing development and scheduled for production and issue into the inventory. The normal testing cycle includes first those tests on the materiel, conducted by the contractor and the Army commodity commands, which have as their objective the assurance that the test item meets the design specifications and requirements. This first cycle is the engineer design phase which, when successfully completed, demonstrates the engineering feasibility of incomplete system operations, and that the item is ready for independent engineering testing and service testing by USATECOM.

The engineering test phase verifies that the test item or system, incorporating any corrections made to it as a result of the engineer design testing, meets the required technical characteristics and performance, and determines the technical and maintenance suitability of the item for service testing. The suitability of the item or system and its maintenance package for use by the Army is the prime objective of the service test which is conducted by military personnel. This test is conducted under simulated or actual field conditions to determine if the item or materiel will perform the required mission. This tactical or operational type test provides the basis for recommendations on type classification of the item or system under development.

Development and testing of a complex missile system can be costly and time consuming, and the cycle is further lengthened and becomes more costly when technical difficulties and failures occur during development. All organizations affected are constantly seeking ways by which the time and costs in the development cycle can be reduced and yet field a system

that incorporates maximum corrections of deficiencies and shortcomings found during testing. However, the means selected to achieve such goals must not significantly degrade or eliminate required characteristics of the item or system under development.

Certain unique approaches to attain these goals are being applied in the Lance guided missile system and the improvement program for Pershing. The prime engineering test agency of USATECOM, the White Sands Missile Range (WSMR), in the initial stages of program development prepares a comprehensive engineering test program based on the system technical criteria. Coordination with the project manager concerned indicates the testing planned by the contractor or project manager during the engineer design phase. Those test objectives re-

quired by WSMR are incorporated in the engineer design test to the maximum extent practicable, and the results will be utilized by WSMR in the final engineering test evaluation. This approach is predicated on the conditions of valid tests results and no significant changes being made to the system prior to engineering test and service test. The result of this coordinated effort should be a minimum engineering test and reduction in test time and cost. In addition, WSMR personnel will monitor or take part in the engineer design testing.

Early involvement of military personnel from the service test agency is another of the approaches being used to improve development and testing of the Lance, and the improvements to the Pershing. A Lance test team, composed of two officers and 10 senior NCOs from the Army Artillery Board of USATECOM, was formed to assist the project manager and the contractor during the engineer design testing. This team represents a wealth of field experience in field artillery missile and rocket systems, including Corporal, Redstone, LaCrosse, Honest John, Little John, Sergeant and Pershing.

Training for the team on the Lance system was originally provided by the contractor. The primary effort of the team has been to assist the project manager in debugging the equipment and serving as crew members in the system operational testing. These tests are under the direction of the project manager and are conducted on engineering models and tactical prototypes. The developmental effort is culminated in the engineering test and service test of the production configuration by USATECOM.

Some of the tests, which the Artillery Board has conducted or participated in on the Lance engineering model—and most recently on tactical prototype, include field tests, simulated arctic tests, air drop tests,



Lt. Col. Phillip H. Donahue, USA, has been assigned to the U. S. Army Artillery Board, Fort Sill, Okla., as chief project officer for the Lance missile system testing since March 1964. Prior to joining the Artillery Board, he served with the Special Ammunition Support Command in Europe. He is a graduate of the U. S. Military Academy.

sighting and laying repeatability/accuracy tests, prelaunch reliability tests, and maintenance evaluation. These have been conducted as simulated tactical exercises where possible and, in all cases, artillery personnel were used as crewmen. Numerous problems were revealed during these tests. Of the deficiencies, shortcomings, or suggested improvements disclosed during the engineering model testing, nearly 25 percent were found solely as a result of troop participation. All were considered during design reviews and, for the most part, resulted in equipment design changes or in operational and maintenance procedural changes. Artillery Board participation does not end with the completion of various tests. Board personnel attend design review meetings and working group sessions to insure that the field (tactical) problems disclosed are clearly understood by design engineers.

Tactical prototype model testing of the Lance is in progress with increased Artillery Board participation. Techniques for processing problem areas disclosed during tests have improved. Contractor awareness and understanding of tactical needs have increased. The suitability of the design of production equipment should consequently be enhanced.

Many of the Lance problems identified would have been found by the contractor had he remained the sole testing agency. However, past experience has demonstrated that many would not have been identified, or at least their significance would not have been realized. The key, then, is the early integration of contractor engineers and USATECOM personnel for testing the system in its early development and under simulated tactical conditions. It is the early integration of USATECOM test agencies that provides the difference. Somewhat similar procedures are being followed for testing of the major improvement program for Pershing with significant results expected.

A preliminary evaluation of the results of early integration of USATECOM test agencies in the engineer design testing of the Lance appears to be very favorable. Unless the basic design is drastically changed, much of the planned engineering testing will be reduced with result-

ant decrease in cost and testing time. The active participation of service test personnel in engineer design testing has been mutually beneficial to the Lance project manager and USATECOM. The Artillery Board test team, through actual operation of the equipment, had made many significant suggestions for improvements to the system. The team is under the command of the Artillery Board project officer scheduled to conduct the service test of the Lance; thus, the team and its leader will carry the training and experience gained into the engineering test and service test phase. Therefore, much of the service testing may possibly be verification of system capabilities and characteristics.

Such a concept as has been described may be applicable to costly systems of a complex nature; however, it is not suitable for application to all materiel under development, and testing and a complete evaluation of the approach has not been completed. USATECOM will continue its search for more effective, economical, but comprehensive methods of testing Army materiel to achieve reliable testing results.

Assault Helo Office Established in Air Systems Command

The Naval Air Systems Command has established an Assault Helicopter Office which will bring together four helicopter programs (CH-46, CH-53, UH-1 and AH-1) and the Integrated Helicopter Avionics System (IHAS) under a single project manager.

Purpose of the new organization is to strengthen management authority and effectiveness, particularly at the project management level, to enable the Defense Department to acquire, deploy, operate and support assault helicopter systems with the performance capabilities required within the approved schedules and resources.

Named to head the new office is Colonel K. L. Reusser, USMC. Prior to his new assignment, Colonel Reusser commanded a Marine helicopter group in Vietnam.

Commercial Firms Called On for Repair of Army Aircraft

An urgent need for commercially operated plants having the capability for repair and overhaul of Army aircraft and components has been announced by the U.S. Army Aviation Materiel Command (AVCOM) of St. Louis, Mo.

According to AVCOM officials, about 8.5 million manhours of direct labor will be required in aircraft rehabilitation on a commercial basis during the coming fiscal year with a heavier workload predicted for FY 1970.

Fourteen Army aircraft systems, including both rotary and fixed wing, are involved in the expanded commercial overhaul program, including a wide variety of engines, transmissions, rotor blades and other related equipment.

In the past, AVCOM has depended largely upon government-owned and operated repair facilities. With the increased demands due to attrition resulting from the war in Vietnam, greater dependence will be placed upon commercial firms in meeting repair requirements.

Commercial concerns interested in possible contracts for repair and overhaul of Army aircraft and components are urged to contact Leonard Richman, Chief, Industrial Assistance Office, Army Aviation Command, P.O. Box 209, St. Louis, Mo. 63166. Additional information will be forwarded to interested companies identifying items and quantities for which AVCOM will make solicitation on a competitive basis.

Temporary Construction Order Rescinded

The Defense Department has announced the rescinding of the temporary order of Oct. 5, 1967, deferring certain military construction projects not associated with Southeast Asia or otherwise essential.

This action reinstates the remaining FY 1967 and prior year construction projects, as well as FY 1968 construction projects, amounting to a total value of about \$800 million.

Man-Job Match

The Door is Open

Major General John B. Bestic, USAF

Consider the immensity of job placement activities in an organization of nearly one million persons. Mix in over 90 divergent specialties in a world-wide situation. Add the requirement for periodic transfer to effect training and assignment to positions of increasing responsibility. Eliminate personal interviews, except for a relatively few senior management positions. This is the problem, very much over simplified, facing the Deputy Chief of Staff for Personnel of the U.S. Air Force.

Recent developments at the Electronic Systems Division of the Air Force Systems Command, however, have opened the door to computer-assisted personnel assignments. Aptly titled Man-Job Match, this development planning study has paved the way for effective use of manpower.

Not that the system is ready to start reassigning personnel today; a great many factors have yet to be incorporated. But, the method exists, the techniques are feasible, the need is apparent.

The prime obstacle is people. Initial reaction to any suggestion that a computer be used to decide where one should be assigned is something like "over my dead body." In fact, the very basis of the Man-Job Match concept is that the system is a computer-assist for the personnel manager. It is responsive to the manager's needs in handling myriad bookkeeping details involved, offering periodic reports of progress at managerial decision points, and maintaining and updating files. The Man-Job Match system is not designed to replace that vital link, the personnel assignment manager. It is a tool, an assistant—call it what you will. It provides a means whereby this manager can and should be the

the feasibility of applying computer technology to the intricate process of personnel assignments. It became immediately apparent, however, that no worthwhile conclusions were possible without some extensive experimentation.

The facilities at the Electronic Systems Division offered the means by which this could be accomplished. A new general purpose data management system, called ADAM (acronym for Advanced Data Management), was implemented on the IBM 7080 (STRETCH) computer. ADAM is a software tool used as a design aid. It provides the necessary framework into which new processes and procedures can be inserted for rapid evaluation and easy modification. ADAM provided the necessary tools to model an assignment system: file generation, on-line file updating, event-triggered reporting, and a query language. This, with the tre-

mendous power of the computer, made modeling changes relatively simple.

The team selected to do the work consisted of representatives from the offices of the Assistant for Personnel Systems and the Deputy Chief of Staff, Personnel, Air Force headquarters; and the Director of Computers and Technology of the Electronic Systems Division. They started with the results of a research effort conducted from September 1962 to October 1964 by the Personnel Systems Development Office, formerly under the Assistant for Personnel Systems.

This, of course, was not the first effort based on the idea of matching men to jobs. There was major air command interest as early as 1959, and one of the more successful schemes was Project Square Peg. This was a punched card system employed by the Air Force Systems Command for effective resource management of scientific and engineering talent. It has been expanded to include all colonels and all other grades and career fields requiring an advanced degree.

In January 1965, the Assistant Air Force Secretary for Research and Development approved the statement of work and the team effort was officially launched. While the original objective—to identify the necessary techniques and methods leading to the development of a computer-oriented, centralized personnel assignment capability—remained, the requirement for the design and construction of an experimental model became the key to the whole project.

Two models were eventually built from the design specifications. The first (Mod I), crude and inefficient, used a file of 175 men in the United States from the weather officer career field (AFSC 2524) and 200 overseas jobs. The man file used realistic, but hypothetical, data. The job file was constructed to fit the needs of the experiment, since no real job file



Maj. Gen. John B. Bestic, a native of Fargo, N. D., has served as Commander, Electronic Systems Div., Air Force Systems Command, since July 1, 1967. Gen. Bestic is a 1939 graduate of the U. S. Military Academy and served primarily in communications assignments during his 28 military service.

existed. Typical entries were based on the Project Square Peg concepts.

Mod I was demonstrated in August 1965 to selected personnel officers. It functioned convincingly in its limited fashion. The foremost result was the decision to expand the scope and comprehensiveness of the project by which means a solid foundation could be established.

The second model (Mod II) encompassed two entire career fields: Weather (25XX) and Personnel (73XX). The officer records, the man file, were the Uniform Officer Records current as of December 1965. The job records, the job file, were actual job descriptions. Each of these files contained about 5,800 records and provided a good test base from which to operate.

Mod II became operational in August 1966 and was demonstrated to personnel assignment officers from throughout the Air Force in late October. These representatives accomplished a review and evaluation of sample assignments, as determined by the Man-Job Match model, in the light of their own experience. They were enthusiastic concerning the flexibility and adaptability of the system. That they had "control" of the system and could both affect and effect assignments, while being relieved of the tedious bookkeeping, was of prime importance to them.

Even before the project was fully documented at the Electronic Systems Division, the next big step had been taken. In mid-March 1967, the Air Force initiated the major command Man-Job Match Project. The purpose was defined to be:

- To design, program and conduct prototype tests of a proposed major command computerized Man-Job Match assignment and career support system for line officers, warrant officer through lieutenant colonel.

- To develop a standard major command Man-Job Match assignment system for processing on standard automatic data processing equipment (the H800/200 system) at the commands. This standard system is to be an effective management tool assisting the major commands in the optimum assignment of available Air Force officers to current and projected vacant positions.

The door has indeed been opened.

DOD Announces Increase in Progress Payment Rates

A change in procurement regulations has been effected by the Defense Department to increase the normal progress payment rates from 70 percent of total incurred costs to 80 percent, under fixed-price contracts having long lead time. For small business concerns, the rate was increased from 75 percent to 85 percent.

The change was made to align financial assistance policies with the greatly increased use of fixed-price contracts by DOD over the past several years. Fixed-price contracts rose from 57.4 percent in contract dollars in 1960 to 78.9 percent in 1967.

The new guidelines are published in Defense Procurement Circular (DPC) No. 58. A more complete description of DOD financial assistance policies is contained in Appendix E of the Armed Services Procurement

Regulation. The change contained in DPC No. 58 is as follows:

"E-503 and E-501.1 provide for customary progress payments at the rate of 70 percent of total incurred costs, except that the rate is 75 percent for certain contracts with small business concerns.

"For new contracts (those entered into on or after 1 March 1968), these customary rates will be respectively 80 and 85 percent and such percentages should be substituted in the E-510.1 clause when included in such contracts. For this purpose, new contracts include definitive contracts which supersede letter contracts awarded prior to 1 March 1968.

"This increase of progress payment percentages does not apply to contracts existing before 1 March 1968 or to orders under or modifications of such contracts, whether or not involving additional work or quantities."

Air Defense Command Renamed Aerospace Defense Command

The Air Defense Command, Ent AFB, Colo., was redesignated the Aerospace Defense Command, effective Jan. 15, 1968.

The new designation is intended to better describe the current mission of the command, as increased emphasis continues to be placed on space.

A major component of the North American Air Defense Command, the Aerospace Defense Command has a defense arsenal that includes supersonic fighter-interceptor aircraft, Bomarc ground-to-air missiles, and Genie air-to-air missiles capable of carrying nuclear warheads.

Antisatellite defense of North America, detection and identification of all man-made objects in orbit around the earth, and operation of the ballistic missile early warning system (BMEWS) are only three of the command's vast responsibilities in space surveillance and defense.

Phase III of Joint V/STOL Program Dropped

The U.S. Defense Department and the Federal Ministry of Defense, Federal Republic of Germany have announced that Phase III (prototype acquisition) of the joint U.S.-FRG V/STOL Tactical Fighter Program will not be initiated.

Top military research and development officials of both countries have complimented EWR-Fairchild International on their performance during Phase II of the program. However, due to the lack of a firm operational requirement at this time, a decision has been made against pursuing the program.

EWR-Fairchild is the joint venture organization established by the contractors, Entwicklungsring Sud (EWR) of Germany and the Republic Aviation Division of Fairchild Hiller of the United States.

In accordance with the basic agreement of 1964, the two governments are planning to continue review of V/STOL aircraft requirements and develop a general program to provide for the advances in technology necessary to meet the future V/STOL objectives of the two countries.

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	Jul	Aug	Sep	III	Oct	Nov	Dec	IV
I. Military Prime Contract Awards														
Aircraft.....	\$1,945	\$2,389	\$2,696	\$2,262	\$3,102	\$3,049	\$ 394	\$ 636	\$1,483	\$2,513	\$1,249	\$ 578	\$ 805	\$3,632
Missile & Space Systems.....	1,040	387	1,314	861	1,330	1,106	535	521	524	1,580	323	429	316	1,068
Ships.....	355	491	876	239	679	407	178	104	135	417	153	147	110	410
Weapons & Ammunition.....	555	1,486	692	940	818	1,709	92	415	597	1,104	454	451	139	1,344
Electronic & Communications Equip.....	918	1,574	666	940	971	1,848	169	364	283	816	272	247	305	824
Other Hard Goods.....	843	1,842	660	1,029	915	1,564	202	355	228	785	252	153	248	653
Soft Goods.....	709	922	1,078	989	638	1,078	588	280	188	1,056	175	118	198	491
Construction.....	207	392	198	150	232	625	56	100	76	232	56	44	113	213
All Other.....	1,406	1,963	2,356	1,639	1,605	1,987	1,194	568	573	2,335	522	486	649	1,657
Total (Excl. Work Outside U.S.).....	7,978	12,646	10,556	9,024	9,190	13,068	3,408	3,343	4,087	10,838	3,456	2,653	3,183	9,292
Total Seasonally Adjusted.....	8,703	10,141	10,716	10,149	10,171	10,667	3,610	3,686	3,665	10,961	3,065	3,329	3,467	10,461
Work Outside U.S.....	521	1,195	856	672	453	834	314	382	195	891	193	117	145	455
II. Gross Obligations Incurred														
Operations.....	8,326	9,604	10,426	9,702	10,229	11,435	3,700	3,835	3,659	11,254	3,776	3,374	---	---
Procurement.....	4,374	8,539	4,368	4,276	5,113	8,948	1,045	1,894	3,215	6,154	2,699	1,717	---	---
Other.....	2,429	3,470	3,453	2,330	2,519	3,510	1,246	1,062	1,112	3,420	860	665	---	---
Total.....	15,129	21,613	19,247	17,208	17,861	23,893	5,991	6,791	8,016	20,798	7,335	5,755	---	---
III. Gross Unpaid Obligations Outstanding														
Operations.....	3,828	3,777	4,792	5,024	4,644	4,513	NA	5,115	5,267	5,267	5,270	5,080	---	---
Procurement.....	18,023	22,119	22,736	23,173	22,780	25,248	NA	23,674	24,925	24,925	23,423	24,482	---	---
Other.....	5,747	7,392	8,179	7,588	7,626	8,270	NA	8,559	8,722	8,722	8,598(R)	8,340	---	---
Total.....	27,598	33,288	35,707	36,085	35,050	38,031	NA	37,548	38,914	38,914	39,291(R)	38,372	---	---
IV. Net Expenditures														
Operations.....	7,689	9,076	8,968	9,087	10,002	10,731	2,898	3,722	3,382	10,001	3,641	3,456	3,397	10,494
Procurement.....	3,651	3,886	4,392	4,264	5,074	5,282	2,037	1,982	2,041	6,060	2,005	1,890	1,704	5,999
Other.....	2,737	2,647	2,484	3,092	3,179	2,001	1,231	883	933	3,047	790(R)	847	723	2,360
Total.....	14,097	15,609	15,844	16,443	18,255	18,014	6,166	6,587	6,356	19,108	6,436(R)	6,194	5,824	18,453
V. DOD Personal Compensation														
Military.....	3,181	3,249	3,551	3,606	3,624	3,646	1,310	1,260	1,272	3,842	1,264	1,297	776(p)	2,321(p)
Civilian.....	1,937	2,015	2,105	2,135	2,170	2,248	736	793	742	2,271	773	772	---	---
Total.....	5,118	5,264	5,656	5,741	5,794	5,894	2,046	2,053	2,014	6,113	2,037	2,069	---	---
VI. Outstanding Payments														
Advance Payments.....	66	79	90	83	92	80	---	---	---	110	---	---	---	---
Progress Payments.....	4,402	4,346	4,750	5,461	5,981	6,765	---	---	---	7,179	---	---	---	---
Total.....	4,468	4,425	4,840	5,544	6,073	6,845	---	---	---	7,289	---	---	---	---
VII. Strength (Manpower)														
Military.....	2,969	3,094	3,229	3,334	3,371	3,377	3,382	3,393	3,412	3,412	3,416	3,412	1,271(p)	1,271(p)
Civilian.....	1,088	1,138	1,184	1,230	1,268	1,303	1,311	1,308	1,274	1,274	1,277	1,277	---	---

NA = Not Available

P = Preliminary

R = Revised

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
29 January 1968

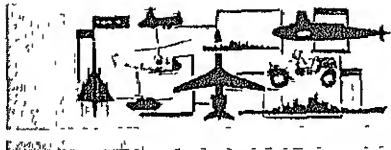
SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	Jul	Aug	Sep	III	Oct	Nov	Dec	IV	1968 Jan
I. <i>Military Prime Contract Awards</i>															
Aircraft.....	\$1,945	\$2,989	\$2,696	\$2,262	\$2,102	\$3,049	\$ 394	\$ 636	\$1,483	\$2,513	\$1,249	\$ 578	\$ 805	\$ 2,632	\$ 442
Missile & Space Systems.....	1,040	987	1,314	861	1,230	1,166	535	521	594	1,580	323	429	316	1,068	348
Ships.....	355	491	876	239	679	407	178	104	135	417	153	137	110	410	109
Weapons & Ammunition.....	555	1,486	692	940	818	1,769	92	415	597	1,104	434	451	339	1,344	296
Electronic & Communications Equip.....	918	1,574	666	915	971	1,848	169	364	283	816	272	247	305	804	359
Other Hard Goods.....	843	1,842	660	1,029	915	1,564	202	355	228	785	252	153	248	653	246
Soft Goods.....	709	922	1,075	989	636	1,588	588	280	138	1,056	175	118	158	491	437
Construction.....	207	392	198	150	232	626	56	100	76	232	56	44	113	213	61
All Other.....	1,406	1,963	2,356	1,639	1,605	1,987	1,194	568	573	2,335	522	486	649	1,687	457
Total (Excl. Work Outside U.S.).....	7,978	12,646	10,536	9,024	9,190	13,068	3,408	3,343	4,087	10,838	3,456	2,653	3,183	9,292	2,685
Total Seasonally Adjusted.....	8,703	10,144	10,716	10,149	10,171	10,667	3,610	3,666	3,665	10,961	3,665	3,329	3,467	10,461	2,862
Work Outside U.S.....	521	1,195	856	672	463	884	314	382	195	891	193	117	145	455	288
II. <i>Gross Obligations Incurred</i>															
Operations.....	8,326	9,604	10,426	9,702	10,229	11,435	3,700	3,835	3,689	11,224	3,776	3,374	3,663	10,812	---
Procurement.....	4,374	5,539	4,368	5,276	5,113	8,948	1,045	1,894	3,215	6,154	2,699	1,717	1,876	6,292	---
Other.....	2,429	3,470	3,453	2,230	2,519	3,510	1,246	1,062	1,112	3,420	800	665	669	2,194	---
Total.....	15,129	21,613	19,247	17,208	17,861	23,893	5,991	5,791	8,016	20,798	7,335	5,755	6,206	19,298	---
III. <i>Gross Unpaid Obligations Outstanding</i>															
Operations.....	3,828	3,777	4,792	5,094	4,644	4,513	NA	5,115	5,267	5,267	5,270	5,050	5,150	5,150	---
Procurement.....	18,023	22,119	22,736	23,173	22,780	25,248	NA	23,874	24,925	24,925	25,423	24,982	24,856	24,856	---
Other.....	5,747	7,392	8,179	7,888	7,626	8,270	NA	8,559	8,722	8,722	8,598	8,340	8,082	8,082	---
Total.....	27,598	33,288	35,707	36,055	35,050	38,031	NA	37,548	38,914	38,914	39,291	38,372	38,088	38,088	---
IV. <i>Net Expenditures</i>															
Operations.....	7,689	9,076	8,968	9,087	10,002	10,731	2,808	3,722	3,382	10,001	3,641	3,456	3,397	10,494	---
Procurement.....	3,651	3,886	4,382	4,264	5,074	5,282	2,037	1,982	2,041	6,060	2,005	1,890	1,704	5,598(R)	---
Other.....	2,757	2,647	2,484	3,092	3,160	2,001	1,231	883	983	3,047	790	847	734(R)	2,363(R)	---
Total.....	14,097	15,609	15,844	16,443	18,236	18,014	6,166	6,587	6,356	19,108	6,436	6,194	5,825(R)	18,455(R)	---
V. <i>DOD Personal Compensation</i>															
Military.....	3,181	3,249	3,551	3,606	3,624	3,646	1,310	1,280	1,272	3,842	1,284	1,297	---	---	---
Civilian.....	1,937	2,015	2,105	2,135	2,170	2,248	736	793	742	2,271	773	772	787	2,332	830(P)
Total.....	5,118	5,264	5,656	5,741	5,794	5,894	2,046	2,053	2,014	6,113	2,037	2,069	---	---	---
VI. <i>Outstanding Payments</i>															
Advance Payments.....	66	79	90	83	92	80	---	---	---	110	---	---	---	134	---
Progress Payments.....	4,402	4,346	4,730	5,461	5,981	6,765	---	---	---	7,179	---	---	---	7,491	---
Total.....	4,468	4,425	4,820	5,544	6,073	6,845	---	---	---	7,289	---	---	---	7,625	---
VII. <i>Strength (Manpower)</i>															
Military.....	2,969	3,094	3,229	3,334	3,371	3,377	3,382	3,393	3,412	3,412	3,416	3,412	3,398	3,398	---
Civilian.....	1,088	1,138	1,134	1,230	1,268	1,303	1,311	1,306	1,274	1,274	1,277	1,277	1,271	1,271	1,267(P)

NA = Not Available
P = Preliminary
R = Revised

Note: Open spaces for Indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
29 February 1968



Contracts of \$1,000,000 and over awarded during the month of February 1968.

DEFENSE SUPPLY AGENCY

- 2—J. P. Stevens & Co., New York, N.Y. \$1,257,125. 445,000 linear yards of tropical wool cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1946.
- Southwire Co., Carrollton, Ga. \$1,799,000. 50,000 half-mile field telephone wire dispensers. Defense Industrial Supply Center, Philadelphia, Pa. DSA 500-68-C-8044.
- 7—Trenton Textile Engineering Co., Trenton, N.J. \$1,645,317. 240,900 wet weather parkas. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1463.
- J. P. Stevens & Co., New York, N.Y. \$1,153,500. 800,000 linear yards of wool serge cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1524.
- 9—Kentucky Appalachian Industries, Prestonburg, Ky. \$1,970,811. 10,498 medium general purpose tents with cover and window. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1181.
- 14—West Point Pepperell, Inc., New York, N.Y. \$1,638,975. 2,224,000,000 square yards of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1558.
- 16—LaCrosse Garment Mfg. Co., La Crosse, Wis. \$1,850,681. 119,739 sleeping bags. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1603.
- 19—Spartling Mills, Greenville, R.I. \$2,730,100. 16,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4471.
- Dawling Bag Co., Valdosta, Ga. \$1,150,725. 6,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4458.
- Pioneer Bag Co., North Kansas City, Mo. \$1,406,340. 7,400,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4460.
- Bemis Co., Minneapolis, Minn. \$1,319,875. 7,025,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4470.
- Burlington Industries, New York, N.Y. \$1,470,000. 1,500,000 linear yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1621.
- B. G. Colton & Co., New York, N.Y. \$1,322,375. 1,250,000 linear yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1623.
- Dan River Mills, Inc., Danville, Va. \$1,721,250. 1,700,000 linear yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1622.
- Bibb Mfg. Co., Macon, Ga. \$3,353,630. 697,882 linear yards of high-temperature resistant polyamide cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1595.
- Putnam Mills, New York, N.Y. \$2,395,000. 500,000 linear yards of high temperature resistant polyamide cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1594.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency.

DEFENSE PROCUREMENT

- Campbell Soup Co., Camden, N.J. \$1,029,492. 297,640 cases of ready-to-serve soup. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-02068.
- 23—Genesco, Inc., Florence, Ala. \$1,697,112. 693,880 pairs of men's winter lightweight drawers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1635.
- Carborundum Co., Niagara Falls, N.Y. \$1,495,808. 2,050 sets of body armor. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1580.
- 28—Pettibone Mulliken Corp., Washington, D.C. \$1,872,251. 197 electric forklift trucks with 4,000-lb. capacity, and 96 electric forklift trucks with 6,000-lb. capacity. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4656.
- 29—Southern Packaging & Storage Co., Greenville, Tenn. \$1,200,384. 1,782,000 cases of individual combat meals. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-092A1.



DEPARTMENT OF THE ARMY

- 1—Kennedy Van Saun Corp., Danville, Pa. \$1,947,020. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0109.
- Bethlehem Steel, Bethlehem, Pa. \$4,000,000. Tube forgings for 175mm guns (M113). Army Arsenal, Watervliet, N.Y. DA-AF07-68-C-0153.
- Mohawk Rubber Co., Akron, Ohio. \$1,650,602. Pneumatic tires. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1365.
- General Motors, Indianapolis, Ind. \$2,634,948. Rebuilding/retrofitting of transmissions for M48 and M103 tanks. Tank Automotive Command, Warren, Mich. DA-20-113-AMC-12016 (T).
- 2—Texas Instruments, Dallas, Tex. \$1,700,000. Night Vision Aerial Surveillance Systems. Mobility Equipment Research & Development Center, Fort Belvoir, Va. DA-AK02-68-C-0308.
- Klaco Co., St. Louis, Mo. \$1,008,537. Shipping containers for 20mm projectiles. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0421.
- International Harvester Co., Chicago, Ill. \$1,106,332. Tractor trucks and dump trucks. Springfield, Ohio, Fort Wayne, Ind., and Chatham, Ontario, Canada. Tank Automotive Command, Warren, Mich. DA-AE-68-C-1318.
- Hercules Engines, Inc., Canton, Ohio. \$34,102,681. Multi-fuel engines for 2½-ton trucks and one lot of concurrent repair parts. General Purpose Vehicle Project Manager, Warren, Mich. DA-AE06-68-C-0006.
- Kaiser Jeep Corp., Toledo, Ohio. \$117,893,298. 2½-ton trucks. South Bend, Ind., Ruf, Neb. and Lima, Ohio. General Purpose Vehicle Project Manager, Warren, Mich. DA-AE06-68-C-0007.
- 5—Magnavox Co., Urbana, Ill. \$5,917,685. Artillery gun direction computers. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0429.
- General Motors, Detroit, Mich. \$2,145,009. Various trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1322.
- State of Illinois, Department of Public Works and Buildings, Springfield, Ill. \$1,793,000. Removal and replacement of Illinois State Highway No. 164 bridge with a substitute fixed-span high-level bridge to

- allow passage of navigation Baldwin, Ill. Engineer Dist., St. Louis, Mo. DA-CW43-68-C-0013.
- Baldwin Electronics, Little Rock, Ark. \$1,609,601. Loading, assembling and packing 2.75-inch rocket motors. Camden, Ark. Picatinny Arsenal, Dover, N.J. DA-AA21-67-C-0756.
- AVCO Corp., Stratford, Conn. \$1,218,255. Production facilities for spare parts for UH-1 helicopter engines. Aviation Material Command, St. Louis, Mo. DA-23-204-AMC-04152 (T).
- 6—United Aircraft, East Hartford, Conn. \$3,075,000. CH-54A aircraft engines. Aviation Material Command, St. Louis, Mo. DA-AJ01-67-C-0875.
- Northland Camps, Inc., Nampa, Idaho. \$2,095,843. Procurement of trailer type houses including furniture and air conditioning to be used for housing technical personnel engaged in the Nike-X research and development program at Kwajalein Atoll, Marshall Islands. Engineer Dist., Honolulu, Hawaii. DA-CA83-68-C-0012.
- 7—American Machine & Foundry Co., Brooklyn, N.Y. \$3,921,576. Metal parts for 750-lb. bombs. Garden City, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0161.
- Lear Siegler, Inc., Anaheim, Calif. \$4,309,831. Metal parts for 105mm cartridge fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0293.
- Christberg, Inc., Seattle, Wash. \$2,259,275. Construction of 20 miles of gravel surface road, erection of a 200-man trailer type construction camp, construction of camp utility systems and erection of miscellaneous camp buildings at Amchitka Island, Alaska. Engineer Dist., Anchorage, Alaska. DA-CA85-68-C-0053.
- 8—C. H. Leavell & Co., Houston, Tex. \$15,085,615. Construction of a basic military training facility at Lackland AFB, Tex. Engineer Dist., Fort Worth, Tex. DA-CA63-68-C-0060.
- Chamberlain Mfg. Corp., New Bedford, Mass. \$4,910,415. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0321.
- General Electric, Burlington, Vt. \$4,985,718. 20mm automatic guns. Procurement Agency, New York, N.Y. DA-AF03-67-C-0033.
- Northrop Corp., Anaheim, Calif. \$2,128,289. 105mm projectiles. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0517.
- Chamberlain Mfg. Corp., New Bedford, Mass. \$1,987,776. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0325.
- 9—Rulon Co., Chicago, Ill. \$4,853,501. Metal parts for 105mm cartridge fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0296.
- R. G. LeTourneau, Inc., Longview, Tex. \$3,219,827. 750-lb. bomb fin assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0329.
- John Wood Co., St. Paul, Minn. \$3,006,848. 750-lb. bomb fin assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0328.
- Guy H. James Construction Co., Oklahoma City, Okla. \$3,167,298. Alteration of the Will Rogers Turnpike Twin Bridges over the Verdigris River to permit passage of project navigation Catowka, Okla. Engineer Dist., Tulsa, Okla. DA-CW56-68-C-0090.
- P. R. Mallory and Co., Inc., Tarrytown, N.Y. \$2,385,604. Dry batteries. Lexington, N.C. Electronics Command, Philadelphia, Pa. DA-AB05-67-D-2982.
- Honeywell, Inc., St. Petersburg, Fla. \$1,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- 12—Bechtel Corp., Vernon, Calif. \$1,692,016. Architect engineer services for design of Sentinel anti-ballistic missile system radar power plant. Office of Chief of Engineers, Washington, D.C. DA-CA-73-68-C-0096.

- General Dynamics, Rochester, N.Y. \$4,151,538. AN/GRC-106 radio sets. Electronics Command, Philadelphia, Pa. DA-AB05 68-C-0003.
- Honeywell, Inc., Hopkins, Minn. \$3,919,965. Point detonating fuzes for 40mm cartridges. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0114.
- Olin Mathieson Chemical Corp., LaPorte, Ind. \$1,156,852. Loading, assembling and packing of 20mm incendiary cartridges. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0430.
- 13—Fordice Construction Co., Delta, La. \$1,681,160. Revetment materials for the Mississippi River and Tributaries Flood Control Project. Engineer Dist., New Orleans, La. DA-CW-29-68-C-0127.
- T. L. James & Co., Inc., Ruston, La. \$1,233,362. Navigational channel dredging. Morrilton, Ark. Engineer Dist., Little Rock, Ark. DA-CW03 68-C-0040.
- Matson Terminals, Inc., San Francisco, Calif. \$14,825,000. Stevedoring and related services for period of March 1, 1968 through Feb. 28, 1970. Military Traffic Management & Terminal Services, Oakland, Calif. DA-IIC-23-68-D-0076.
- California Stevedore & Ballast Co., San Francisco, Calif. \$24,608,000. Stevedoring and related services for period March 1, 1968, through Feb. 28, 1970. Military Traffic Management & Terminal Services, Oakland, Calif. DA-IIC23 68-D-0075.
- Marline Terminal Corp. of Los Angeles, Long Beach, Calif. \$18,811,000. Stevedoring and related services for period of March 1, 1968, through Feb. 28, 1970. Military Traffic Management & Terminal Services, Oakland, Calif. DA-IIC23 68-C-0071.
- Chamberlain Mfg. Corp., Waterloo, Iowa. \$1,325,964. High explosive projectiles. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0691.
- 14—Reech Aircraft Corp., Wichita, Kan. \$3,258,000. Modification of U-21A aircraft. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-0794.
- Raytheon Co., Lexington, Mass. \$3,070,200. Metal parts for 750-lb bombs. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09 68-C-0027.
- Continental Motors, Mobile, Ala. \$2,794,500. Rebuild and retrofit of M88 recovery vehicle engines. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-1166.
- 15—Harvey Aluminum Sales, Torrance, Calif. \$15,366,031. Loading, assembling and packing miscellaneous items of medium caliber ammunition and components, and for maintenance and support services at the Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC 00620 (A).
- UNECO, Inc., Bellevue, Neb. \$3,536,038. Metal parts for 105mm cartridge fuze components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0300.
- Keystone Mfg. Corp., Boston, Mass. \$1,758,860. Metal parts for 105mm cartridge fuze components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0356.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$1,404,928. Modernization and support activities in support of production of metal parts for 175mm, M437 projectiles. Seaton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-36-034-AMC 00163 (A).
- Raytheon Co., Andover, Mass. \$0,124,215. Line items of Hawk missile system ground support equipment. Army Missile Command, Huntsville, Ala. DA-A101 68-C-0073.
- Raytheon Co., Lexington, Mass. \$1,593,322. Industrial engineering services for the self-propelled Hawk Missile System. Army Missile Command, Huntsville, Ala. DA-01-021-AMC-12647 (Z).
- 16—Philco-Ford, Newport Beach, Calif. \$1,573,517. FY 1968 research and development on the Chaparral missile system. Anaheim, Calif. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0725.
- E. I. Dupont De Nemours Co., Wilmington, Del. \$1,072,401. Establishment of lead azide manufacturing facilities at the Kansas Army Ammunition Plant, Parsons, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0213.
- National Gypsum Co., Buffalo, N.Y. \$17,961,860. Loading, assembling and packing of 105mm and 81mm projectiles and fuzes. Parsons, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC 00095 (A).
- Raytheon Co., Andover, Mass. \$3,373,040. Factory test equipment and gauging for the improved Hawk missile system. Army Missile Command, Andover, Mass. DA-A101-67-C-A028.
- General Motors, Detroit, Mich. \$2,582,133. 924 delivery trucks. Flint, Mich. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1424.
- AVCO Corp., Stratford, Conn. \$18,059,660. T-53-L-13 engines for various helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-0954.
- Philco-Ford Corp., Philadelphia, Pa. \$1,000,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- Martin Zachry Constructor, Honolulu, Hawaii. \$2,100,000. Construction work on site preparation for 200 trailers at Kure Island Atoll. Engineer Dist., Honolulu, Hawaii. DA-01-612-ENG 04111.
- 19—Hercules, Inc., Wilmington, Del. \$12,088,267. Propellants and explosive materials, and support services at the Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-W-11-173-AMC 00037 (A).
- Whittaker Corp., Snugus, Calif. \$1,681,090. MK 125 launchers for 2.75-inch rocket motors. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0674.
- 20—Philco-Ford Corp., Newport Beach, Calif. \$1,399,650. Test sets for the Shillelagh guided missile system. Army Missile Command, Huntsville, Ala. DA-AH01 67-C-1146.
- General Motors, Detroit, Mich. \$1,308,788. Diesel engines for the M113 family of vehicles. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-0110.
- 21—Brunswick Defense Corp., Muskegon, Mich. \$1,011,441. Half-ton platform utility trucks. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-1572.
- Peter Klewit & Sons Construction Co., Vancouver, Wash. \$1,424,062. Construction of recreation facilities. Gilliam County, Sherman County and Umatilla County, Ore. Engineer Dist., Walla Walla, Wash. DA-CW68-68-C-0064.
- General Research Corp., Santa Barbara, Calif. \$1,291,925. ARPA system research studies. Army Missile Command, Huntsville, Ala. DA-AH01-07-C-1331.
- TRW, Inc., Redondo Beach, Calif. \$1,000,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- 22—Philco-Ford, Philadelphia, Pa. \$2,531,000. Maintenance and operation service for integrated Wide Band Communication Sites in Southeast Asia. Electronics Command, Fort Monmouth, N.J. DA-28 043 AMC 01694 (E).
- Amron Corp., Waukegan, Wis. \$1,178,480. Classified ammunition components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09 68-C-0046.
- Wyatt-Klipper Engineers, Seattle, Wash. \$1,079,655. Conversion of heating plant boilers from coal to natural gas and for a 10,000 barrel oil storage tank. Elmendorf AFB, Alaska. Engineer Dist., Anchorage, Alaska. DA-CAS6 68-C-0054.
- AVCO Corp., Richmond, Ind. \$1,010,938. Classified ammunition components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0016.
- 23—General Motors, Detroit, Mich. \$1,187,708. V63 diesel engines for M113 vehicles. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0410.
- General Motors, Indianapolis, Ind. \$1,113,000. Breech mechanism assemblies for 162mm gun/launchers. Army Arsenal, Watervliet, N.Y. DA-AF07-67-C-0065.
- Marathon Battery Co., Wausau, Wis. \$2,180,200. Dry batteries. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2263.
- Clevite Corp., Freeport, Ill. \$2,310,000. Dry batteries. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2254.
- Motorola, Inc., Chicago, Ill. \$2,710,800. Metal parts for boosters for artillery fuzes. Elk Grove Village, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0340.
- 27—Technical Operations, Inc., Burlington, Mass. \$3,241,600. 1,480 man-months of scientific and technical effort in support of studies, analyses, and evaluation of war games. Arlington, Va. Army Procurement
- Agency, Oakland, Calif. DA-AG05-67-C-0647.
- Whirlpool Corp., Evansville, Ind. \$1,301,427. 100mm anti-personnel projectiles. Picatinny Arsenal, Dover, N.J. DA-AA21 68-C-0468.
- United Aircraft, Stratford, Conn. \$1,896,600. Blade assemblies for CH-64A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-23-201-AMC 03360 (T).
- 28—William McWilliams Industries, New Orleans, La. \$1,321,051. Dredging work on the Atchafalaya Basin Flood Control Project. St. Martin's and St. Mary's Parish, La. Engineer Dist., New Orleans, La. DA-CW20-68-C-0131.
- C. F. Bean, Inc., Plaquemine, La. \$1,248,980. Construction work on the Atchafalaya Basin Flood Control Project. Iberville Parish, La. Engineer Dist., New Orleans, La. DA-CW29 68-C-0132.
- Ingraham Co., Bristol, Conn. \$1,870,000. Booster metal parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09 68-C-0213.
- Hercules, Inc., Wilmington, Del. \$1,582,164. Electric blasting caps. Port Ewen, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0334.
- General Motors, Indianapolis, Ind. \$3,607,620. Transmission assemblies for M48 and M60 tanks. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-0436.
- E. G. and G., Inc., Albuquerque, N.M. \$1,051,400. Equipment and services in connection with underground nuclear testing at the Nevada Test Site. Defense Atomic Support Agency, DASA01 68-C-0070.
- Mack Trucks, Inc., Allentown, Pa. \$2,025,235. 32 dump trucks, 43 tractor trucks and spare parts for both vehicles. Tank Automotive Command, Warren, Mich. DA-AE 07-68-C-1637.
- 29—Firestone Tire & Rubber Co., Akron, Ohio. \$1,185,776. Maintenance and support services at Ravenna Army Ammunition Plant, Ravenna, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11 173 AMC 00065 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$35,720,968. Operation of plant for production of propelling charges and related items. Indiana Army Ammunition Plant, Charleston, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11 173-AMC 00097 (A).
- Raytheon Co., Norwood, Mass. \$10,132,723. Telephone converters and multiplexers. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA-36 030 AMC-04878 (E).
- Kaiser Corp., Riverside, Calif. \$8,054,770. Construction of an earth fill dam in connection with the Mojave River Reservoir Project. Victorville, Calif. Engineer Dist., Los Angeles, Calif. DA-CW09 68-C-0028.
- McMenamy Contractor, Inc., St. Charles, Mo. \$2,724,340. Dredging and appurtenant work for navigation channel within Dardanelle Reservoir Reach of the Arkansas River Navigation Project. Engineer Dist., Little Rock, Ark. DA-CW03 68-C-0044.
- General Motors, Indianapolis, Ind. \$1,057,387. Turbo shaft engines for the light observation helicopter. Aviation Materiel Command, St. Louis, Mo. DA-AJ01 68-C-1335.
- Stevens Mfg. Co., Eldensburg, Pa. \$1,241,040. Six-ton semi-trailers. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-1614.
- General Motors, Indianapolis, Ind. \$2,183,540. Transmission units or related sections for M107/M109/M110 and M678 tracked combat vehicles. Tank Automotive Command, Warren, Mich. DA-AE07 68-C-0886.
- Chicago Aerial Industries, Barrington, Ill. \$1,300,040. 40 KKA 76 cameras, lens cones and lens carrying cones. Electronics Command, Philadelphia, Pa. DA-AB05 67-C-3302.
- AFC Industries, St. Louis, Mo. \$1,150,573. Body assemblies for fuzes for various size cartridges. Oliveville, Mo. Army Procurement Agency, Chicago, Ill. DA-AA09 68-C-0267.
- Harvard Industries, Inc., Farmingdale, N.J. 602 AN-GRC 60 radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0010.
- A. O. Smith Corp., Chicago, Ill. \$1,081,315. Metal parts for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09 68-C-0078.
- Electro-Optical, Inc., Pomona, Calif. \$1,361,388. Night vision sights. Electronics

- Command, Philadelphia, Pa. DA-AB07-68-C-0262.
- University of Illinois, Urbana, Ill. \$1-200,000 Electronics research. Electronics Command, Fort Monmouth, N.J. DA-AB07-67-C-0199.
- Mack Trucks, Inc., Allentown, Pa. \$1,090,800. Five-ton truck diesel engines. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1625.
- Dana Corp., Toledo, Ohio. \$1,191,027 Transmission assemblies for 2½ and 5-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1631.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,969,113. OV1 Mohawk aircraft and related items. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-0795.
- General Motors, Cleveland, Ohio. \$7,319,520. 81mm projectile M374 bodies and band assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0195.
- Mack Trucks, Inc., Allentown, Pa. \$4,000,000 Ten-ton tractors. Tank-Automotive Command, Warren, Mich. DA-AE07-68-C-0872.



DEPARTMENT OF THE NAVY

- 1—Honeywell, Inc., West Covina, Calif. \$4,373,590. Anti-submarine warfare training devices, including data and support. Naval Training Device Center, Orlando, Fla. N01339-68-C-0086.
- Lockheed Aircraft, Burbank, Calif. \$2,110,060. Classified work on Navy aircraft. Naval Air Systems Command. N00019-67-C-0697.
- Westinghouse Electric, Baltimore, Md. \$1,675,089. AN/APG-59 radar sets. Naval Air Systems Command. N00019-67-C-0173.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$1,677,500. Polaris modification kits. Special Projects Office. N00030-67-C-0222.
- 2—Bell Helicopter Co., Fort Worth, Tex. \$4,688,765. Light training helicopters. Naval Air Systems Command. N00019-68-C-0303.
- United Boatbuilders, Bellingham, Wash. \$1,500,000. Sixth-six 31-foot river patrol boats. Naval Ship Systems Command. N00024-68-C-0285.
- 5—American Mfg. Co. of Tex., Fort Worth, Tex. \$9,887,140. Mark 83, Mod 3 bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3482.
- 6—LTV Aerospace Corp., Dallas, Tex. \$19,468,000. A-7B aircraft. N00019-67-C-0082. \$9,700,000. A-7D aircraft. Naval Air Systems Command. N00019-67-C-0143.
- Honeywell, Inc., Minneapolis, Minn. \$8,419,125. Rockeye II components. Hopkins, Minn. Naval Air Systems Command. N00019-68-C-0316.
- Sperry Rand Corp., St. Paul, Minn. \$5,500,000. Avionics computers. Naval Air Systems Command. N00019-68-C-0255.
- Stromberg-Carlson Corp., San Diego, Calif. \$5,000,000. Tactical display systems. Naval Air Systems Command. N00019-68-C-0253.
- United Aircraft, Stratford, Conn. \$1,500,000. Long lead time effort and materials in support of planned procurement of H11-3F helicopters. Naval Air Systems Command. N00019-67-C-0141.
- General Dynamics, Pomona, Calif. \$3,580,000. Increase of limitation of authorization of production for the Standard missile (medium range). Naval Ordnance Systems Command. N00017-67-C-0047.
- 7—Peterson Builders, Sturgeon Bay, Wis. \$2,376,780. Construction of 100-foot patrol motor gunboards. Naval Ship Systems Command. N00024-68-C-0299.

- General Dynamics, Danvers, Tex. \$1,706,135. Operating and maintenance service to perform research and development testing at the Ordnance Aerophysics Laboratory. Naval Ordnance Systems Command. N00017-68-C-2402.
- 8—United Aircraft, East Hartford, Conn. \$24,857,821. TF30-P-8 engines. Naval Air Systems Command. N00019-68-C-0155.
- Hughes Aircraft, Culver City, Calif. \$2,400,000. Incremental funding for Phoenix missile systems. Naval Air Systems Command. N00019-68-C-0371.
- Mine Safety Appliances, Pittsburgh, Pa. \$1,522,674. Oxygen breathing apparatuses and canisters for fire-fighting and damage control. Evans City, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3950.
- 9—Canadian Department of Defense Production, Washington, D.C. \$1,025,908. Bathythermograph transmitter sets. Dartmouth, Nova Scotia, Canada. Naval Air Systems Command. N00019-68-C-0371.
- Woods-Hole Oceanographic Institution, Woods-Hole, Mass. \$1,062,619. Surveys of ocean characteristics pertaining to acoustic transmission and analysis of surveys. Office of Naval Research.
- G. L. Cory, Inc., San Diego, Calif. \$1,048,135. Construction of an aircraft maintenance hanger at the Naval Air Station, North Island, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N02473-67-C-3014.
- 12—Honeywell, Inc., North Hopkins, Minn. \$32,483,014. MK 46 torpedo main assemblies and related equipment. Naval Ordnance Systems Command. N00017-68-C-1306.
- Goodyear Aerospace Corp., Akron, Ohio. \$5,600,000. Subroc missiles. Naval Ordnance Systems Command. N00017-68-C-1408.
- General Electric, Syracuse, N.Y. \$1,070,000. Operation and maintenance of sonar test equipment. Naval Ship Systems Command. N00024-68-C-1114.
- 13—Thiokol Chemical Corp., Elkton, Md. \$3,165,239. Design and development of a rocket motor for the hyper-velocity aircraft rocket, tactical (HART), air-to-surface missile. Naval Ordnance Laboratory, White Oaks, Md. N00021-68-C-0168.
- 14—Bethlehem Steel, Bethlehem, Pa. \$15,324,456. Steel forgings for MK 14, MOD 0, 16-inch projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3524.
- United Aircraft, Stratford, Conn. \$11,500,000. Long lead time effort and materials in support of procurement of CH-53A helicopters. Naval Air Systems Command. N00019-67-C-0332.
- Blaw-Knox Co., Pittsburgh, Pa. \$10,348,275. Machining of steel forgings into MK 14, MOD 0, 16-inch projectiles. Groveton, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3525.
- 16—Automation Industries, Ann Arbor, Mich. \$1,025,119. Seven degaussing range systems, associated repair parts and services. Naval Ship Systems Command. N00024-68-C-5251.
- 19—Lockheed Aircraft Corp., Burbank, Calif. \$1,183,004. Universal Julie Jazabel Maintenance and Operator Training with data and support. Naval Training Device Center, Orlando, Fla. N-61339-68-C-0131.
- 20—Lockheed Aircraft, Burbank, Calif. \$9,748,200. Modifications to SP-2H aircraft. Naval Air Systems Command. N00019-67-C-0237.
- Lockheed Aircraft, Burbank, Calif. \$3,200,000. Configuration changes to P-3H aircraft. Naval Air Systems Command. N00019-68-C-0043.
- General Time Corp., Skokie, Ill. \$1,171,320. Mechanical time fuses. Naval Air Systems Command. N00019-68-C-0314.
- Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md. \$34,013,360. Research and development for Humblebee. Naval Ordnance Systems Command. N00019-68-C-0604.
- Intercontinental Mfg. Co., Garland, Tex. \$11,216,763. 500-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3626.
- Goodyear Aerospace Corp., Akron, Ohio. \$2,880,460. Updating of an A-6A weapon system trainer component with data and support items. Naval Training Device Center, Orlando, Fla.
- General Motors, Goleta, Calif. \$1,000,000. Design, development, test proof and qualifications of a warhead and exploder for MK 48 MOD 0 torpedoes. Naval Ordnance Systems Command. N00017-1218 Mod 4.
- 21—Kinsaid Co., Honolulu, Hawaii. \$2,230,286. Installation of a power plant and system improvements at the Naval Oceanographic Research Facility, and improvements to the Albatross Abatement System at the Midway Island Naval Station. Pacific Div., Naval Facilities Engineering Command, Pearl Harbor, Hawaii. NBY-79995.
- George Washington University, Washington, D.C. \$1,400,000. Logistics planning research. Office of Naval Research.
- Newport News Shipbuilding & Drydock Co., Newport News, Va. \$1,000,000. Advance planning design and the procurement of long lead time materials in preparation for the overhaul and alteration of the nuclear powered ballistic missile submarine USS Daniel Webster (SSBN-626). Naval Ship Systems Command. N00024-68-C-0203.
- 23—Kaman Aircraft, Bloomfield, Conn. \$2,768,320. Conversion of UH-2A/B helicopter to UH-2C configuration, plus progressive aircraft overhaul. Naval Air Systems Command. N00019-67-C-0084.
- Royal Industries, Santa Ana, Calif. \$2,571,717. External auxiliary 600-gallon fuel tanks. Alhambra, Calif. Naval Air Systems Command. N00019-68-C-0090.
- General Dynamics, Pomona, Calif. \$2,764,715. Engineering services and supplies for Teiler/Tutur and Standard missiles. Naval Ordnance Systems Command. N00017-68-C-2110. G8-0622-025.
- Bendix Corp., Missile Systems Div., Mishawaka, Ind. \$1,000,000. Engineering effort for conversion of Talos Missile Telemetry Systems from VIFF to UIIF and from FM/FM to PAM/FM. Naval Ordnance Systems Command. N00017-68-C-4301c. G8-0622-046.
- 26—United Aircraft, East Hartford, Conn. \$66,046,000. TF30-P-12 and TF30-P-3 engines. Naval Air Systems Command. N00019-67-C-0332.
- F. D. Rich Co., Stamford, Conn. \$3,373,368. Construction of 200 family housing units at the Newport, R.I., naval base. Northeast Div., Naval Facilities Engineering Command, Boston, Mass. NBY-71189.
- 27—Denard Construction Co., San Francisco, Calif. \$1,780,000. Construction of 100 family housing units at Hunters Point Naval Ship Yard, San Francisco, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBY-85507.
- 28—Computer Applications, Inc., New York, N.Y. \$4,048,153. Reliability engineering services in connection with weapon systems under development by the Naval Weapons Center, China Lake, Calif. Ridgecrest, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-2062.
- McDonnell Douglas Corp., Long Beach, Calif. \$1,430,900. Increased limitation of authorization of A-4F aircraft. Naval Air Systems Command. N00019-67-C-0170.
- General Dynamics, Groton, Conn. \$1,000,000. Advanced planning design and procurement of materials in preparation for the overhaul and alteration of the nuclear powered submarine USS Dace (SSN-607). Naval Ship Systems Command. N00024-68-C-0273.
- 29—Ball Bros. Research Corp., Boulder, Colo. \$1,300,000. Development of an Apollo Telescope Mount. Office of Naval Research.
- Continental Electronics Mfg. Co., Dallas, Tex. \$2,510,918. Radio transmitters. Naval Electronic Systems Command. N00039-68-C-1630.



DEPARTMENT OF THE AIR FORCE

- 2—Itel Corp., Palo Alto, Calif. \$6,507,490. Production of airborne radar components for various aircraft. Warner-Robins Air Materiel Area, (AFSC), Robins AFB, Ga. AF 04006 97A-1818.
- Martin-Marietta Corp., Orlando, Fla. \$2,159,862. Production of radio transmitter components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68C-0080-P002.

- 5—International Telephone & Telegraph Corp., Nutley, N.J. \$13,569,862 Production of airborne LORAN navigational sets and related equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio AF 33657-67-C-0524.
- 6—General Electric, Utica, N.Y. \$5,200,000 Airborne electronics countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0664
- 7—Battelle Memorial Institute, Columbus, Ohio \$1,060,000 Operation of the Defense Metals Information Center for FY 1968 Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio AF 33615-68-C-1325
- 8—B. F. Goodrich Co., Akron, Ohio \$1,137,901. Production of aircraft tires Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 342600-68-C-2481-AFIN 1416
- Goodyear Tire & Rubber Co., Akron, Ohio. \$1,837,547 Production of aircraft tires. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 342600-68-D-1367-AFIN 1433.
- Lockheed Aircraft, Burbank, Calif. \$9,233,000. TF 104G aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 333057-67-C-1383.
- Curtiss-Wright Corp., Wood-Ridge, N.J. \$1,828,370. Production of aircraft cylinder assemblies. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 341608 67-A-5900.
- Marwal Steel Co., Richmond, Calif. \$1,553,400. Manufacture of metal bin-type vertical revetments. 2750 Air Base Wing, Wright-Patterson AFB, Ohio. AF 33601-68-C-0581.
- Bunker-Ramo Corp., Canoga Park, Calif \$1,170,633. Production of display consoles. Rome Air Development Center, Griffiss AFB, N.Y. AF 30002-68-C-0221.
- 9—International Telephone & Telegraph Corp., Nutley, N.J. \$4,335,678. Production of airborne LORAN navigational sets and related equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 333057-67-C-0524.
- Hazeltine Corp., Little Neck, N.Y. \$1,468,000. Production of command and control electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 333057-68-C-0530.
- 13—Bendix Corp., North Hollywood, Calif. \$1,226,213. Production of airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F 33657-68-C-0603.
- 14—Sargent Fletcher Co., El Monte, Calif. \$1,588,420. Production of fuel tank assemblies for F-4 aircraft. Oklahoma Air Materiel Area, (AFLC), Hill AFB, Okla. F04600-68-A-0108-QP04.
- Lockheed Missile & Space Co., Sunnyvale, Calif. \$4,508,383. Agena launch services at Vandenberg AFB, Calif., for period Oct. 1, 1967-Sept. 30, 1968. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0070-P-006.
- Cullman Metalcraft, Inc., Cullman, Ala. \$2,649,360. Production of bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0810.
- L.T. Industries, Dallas, Tex. \$2,016,000. Bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657 68-C-0201.
- Radiation, Inc., Melbourne, Fla. \$2,093,763. Design and installation of a telemetry and communication station in the United Kingdom. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701 68-C-0201
- American Electric, Inc., La Mirada, Calif. \$2,649,360. Production of bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0800.
- Superior Steel Ball Co., New Britain, Conn. \$2,025,000. Bomb components. Washington, Ind. Aeronautical Systems Div., (AFSC), Wright-Patterson, AFB Ohio. F33657-68-C-0888.
- Philco-Ford Corp., Palo Alto, Calif. \$4,985,657. Manufacture and installation of a telemetry antenna system. Air Force Eastern Test Range, Patrick AFB, Fla. F 08600-68-C-0031.
- 15—General Electric, Philadelphia, Pa. \$2,600,000. Recent vehicle flight testing. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04 (694)-914.
- Radiation, Inc., Melbourne, Fla. \$1,500,000. Development and production of an

- air/ground communication system. Palm Bay, Fla. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass
- 16—LTV ElectroSystems, Inc., Greenville, Tex. \$1,938,300 Modification of C-130 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F-33657-68-C-0707-P004
- Cessna Aircraft, Wichita, Kan. \$10,394,945 A-37B aircraft spare parts and aerospace ground equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-C-0824-P-25.
- Air Products & Chemical, Inc., Allentown, Pa \$1,225,323. Propellant oxygen and nitrogen Santa Susana, Calif. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 36-600-24258.
- 19—Liton Systems, Woodland Hills, Calif. \$1,375,444 Navigational instrument replenishment spares for F-111A aircraft. Duluth, Minn. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F 4606-67-A-0472-0031
- North American Rockwell Corp., Anaheim, Calif. \$4,519,775 Production of the missile guidance and control systems for Minuteman II missiles. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F 42600-68-2614
- Continental Aviation & Engineering Corp., Detroit, Mich. \$6,701,592 Production of J-69 engines. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- University of Michigan, Ann Arbor, Mich \$1,777,605. Research into measurement of the electro-magnetic characteristics related to weapon delivery applications. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F 33615-68-C-1281.
- 20—International Business Machines Corp., Cape Kennedy, Fla. \$1,501,363. Rental of automatic data processing equipment. Patrick AFB, Fla Air Force Eastern Test Range, Patrick AFB, Fla. AF 08650-68-M-M301.
- 21—Big Three Industrial Gas & Equipment Co., Houston, Tex. \$1,156,845 Production of propellant nitrogen to support Project Apollo. Titusville, Fla. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 41608-68-D-1519.
- 23—Chronally American Corp., New York, N.Y. \$1,257,780. Repair and application of protective metallic coating on J-57 turbine nozzle guide vanes. West Nyack, N.Y. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 1608-67-D-7444.
- 26—Fairchild Hiller Corp., Germantown, Md \$20,801,258. Repair and modification of C-119 aircraft. St. Augustine, Fla. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 09603-68-C-1633
- R&D Constructors, Inc., Park Ridge, Ill \$1,031,720. Aircraft maintenance workstands for C-141 aircraft. Batavia, Ill Warner Robins Air Materiel Area, (AFLC), Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 09603-68-C-1401.
- Olin Mathieson Chemical Corp., East Alton, Ill. \$1,702,748. Bomb components. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-2182.
- General Electric, West Lynn, Mass. \$4,900,000. Component improvement program for the J-85 aircraft engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-512.
- 28—Aerojet General Corp., Sacramento, Calif. \$1,288,000. Work on rocket motors. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 04600-68-A-0068-QP04.
- North Electric Co., Gallon, Ohio. \$5,899,505. Production of central office telephone equipment. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 10628-67-C-0270.
- LTV, Inc., Dallas, Tex. \$1,100,000. Development work on space vehicles. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF04(005)-1050.
- Sperry Rand Corp., Salt Lake City, Utah. \$3,000,000. Development and fabrication of a data relay system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0010.
- 29—General Electric, Cincinnati, Ohio. \$2,000,000. Engineering effort and services for support of the J70 engine during calendar year 1968. Evandale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0527.

New President Named to Defense Science Board

Dr. Robert L. Sproull, Vice President for Academic Affairs at Cornell University, has succeeded Dr. Frederick Seitz, President of the National Academy of Sciences, as chairman of the Defense Science Board.

The board has also received a new vice chairman with Thomas L. Phillips, President of the Raytheon Co., succeeding Patrick E. Haggerty, Chairman of the Board of Directors of Texas Instruments, Inc.

New members-at-large are Dr. John L. McLucas, President of the Mitre Corp.; Dr. Ithiel de Sola Pool, Chairman of the Department of Political Science at Massachusetts Institute of Technology; and Dr. Albert D. Wheelon, Vice President of Hughes Aircraft Co.

The Defense Science Board is chartered as the senior technical advisory body in the Defense Department. It consists of members-at-large appointed from civilian life and of ex-officio members representing major Federal agencies.

Purpose of the board is to advise the Secretary of Defense, through the Director of Defense Research and Engineering, on scientific and technical matters of interest to the Defense Department.

Dr. Seitz and Mr. Haggerty will continue as members of the board.

Subscribers Note

Due to the rapidly increasing number of subscribers to the *Defense Industry Bulletin*, it has become necessary to have our subscription list computerized. As is often the case in such a changeover, we expect problems with addresses for the first few months. If you do not receive your May issue by the 10th of the month, send us a card or letter asking to be put back on the mailing list. If your address is incorrect in any way, send us both the address as it appeared and the correct address.

The Editors

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

POSTAGE AND FEES PAID

OFFICIAL BUSINESS

CLARK M. CLIFFORD BECOMES NINTH SECRETARY of DEFENSE



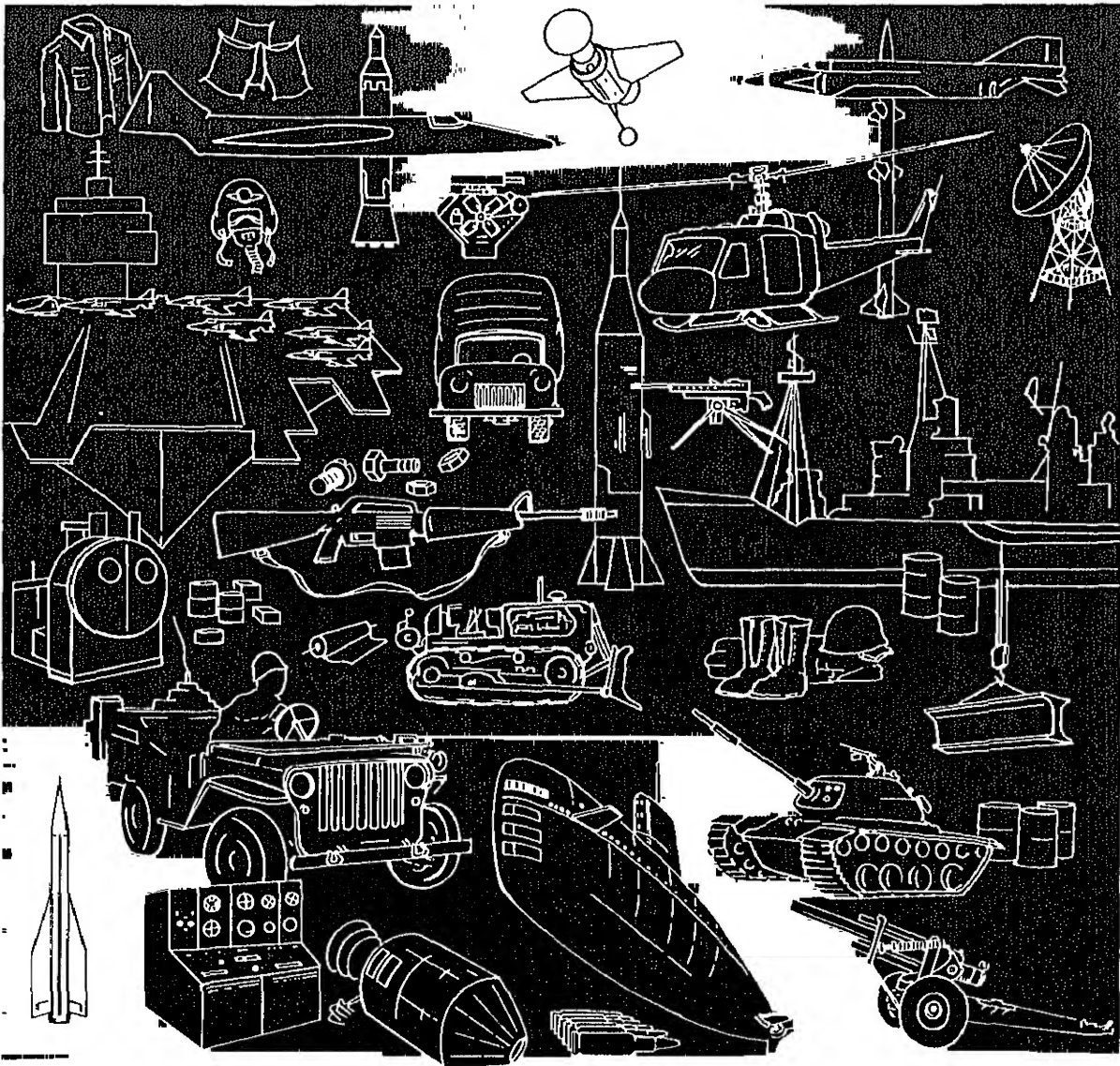
Chief Justice Earl Warren administers the oath of office to Secretary of Defense-designate Clark M. Clifford as Mrs. Clifford and President Lyndon B. Johnson look on. The ceremony took place at the White House March 1.



DEFENSE INDUSTRY BULLETIN

Vol. 4 No. 5

May 1968



DEFENSE CONTRACT ADMINISTRATION SERVICES

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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor, Telephone queries: (202) OXford 5-2709.

The *Bulletin* is distributed without charge each month to representatives of industry and agencies of the Department of Defense, Army, Navy and Air Force. Subscription requests should be made in writing on letterhead and addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301.

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DCAS Comes of Age

Major General John A. Goshorn, USA

The "Boots - Boots" of Rudyard Kipling are still "movin' up and down again" in Vietnam. But they are hardly the same boots. To meet conditions in Vietnam, a new moulded boot with laminated steel insole and nylon uppers had to be developed. So it has been with the thousand of items of logistic materiel such as landing mat, food, uniform, tents, weapons and ammunition which are needed by our Armed Forces.

This part of logistic support is the heart of the mission of the Defense Contract Administration Services (DCAS) of the Defense Supply Agency. DCAS is the link between industry and the soldier, sailor, marine and airman for whom the goods are designed. This organization often provides that last chance to make certain that the combat item is going to be where it is needed on time and will do the job for which it was designed.

In FY 1967, defense prime contract awards totaled \$41.8 billion. The task of converting those dollars into the best available equipment and support, while at the same time keeping defense expenditure to the minimum essential, absorbs the thought and energies of many thousands in Government and many thousands more in industry. The strength and efficiency of the government/industry team is well known. It has served the nation well, and the establishment of DCAS was another step toward making the team even stronger. Until the recent past the facts of time and space gave us a measure of insulation from potential enemies. When emergencies arose, there was always time to mobilize industry and bring its full weight to bear on the problems of military production. Each Military Service hastened to establish its own buying capability and to place contracts with industry as rapidly as possible. The emphasis was naturally on production, and there was little

time to deal with the problems of contract administration, or to resolve the often divergent interests of the Services.

When the emergencies passed, the defense industry disappeared and there was little inclination to seek a permanent solution to what was generally considered to be a transient problem.

The world environment today is quite different. Time and space have shrunk. Expenditures for military goods have remained high. The defense/industry relationship has matured and the DCAS organization reflects the maturity, complexity and sophistication which the problems of today demand.



Maj. Gen. John A. Goshorn, USA, is Deputy Director for Contract Administration Services of the Defense Supply Agency. Prior to assuming his present assignment in August 1966, Gen. Goshorn served as Director of Procurement, Office of Assistant Secretary of the Army (Installations & Logistics); and Deputy Director of Procurement and Production, U.S. Army Materiel Command.

If a point in time were to be selected when it finally became apparent that there might be a better way for Government and industry to work together, it would probably be February 1962. At that time Assistant Secretary of Defense (Installations and Logistics) Thomas D. Morris convened a procurement management improvement conference, to which were invited the key people from all levels of industry and Government having a stake in defense procurement. This conference produced a wide range of recommendations to improve defense procurement. Building on these recommendations, a formal study group (Project 60) was formed and, after an exhaustive look at every aspect of procurement both within Government and industry, this group recommended that defense contract administration be centralized, essentially as it is today, under the present DCAS organization.

As reorganizations go, the creation of DCAS was accomplished with surprising speed. At every step, however, great care was taken not to force reorganization where it was not entirely justified by foreseeable benefits. Industry was kept abreast of the study as it progressed, and the Defense Industry Advisory Council (DIAC) was asked to establish its own study group to analyze the Project 60 recommendations and comment upon them. The DIAC report concluded with the following overall evaluation:

This is the first change proposed by the Defense Department in its procurement procedures during the past three years which holds promise for substantially reducing contract administration work and cost both for industry and the Government.

Since activation of DCAS less than three years ago, it has experienced rapid growth. It now administers over 80 percent of all defense contracts.

Headquarters, DCAS, at Cameron Station, Alexandria, Va., with a total personnel strength of 355, provides policy guidance and coordinates the activities of a field organization of about 24,000. This field organization is divided into 11 regions which, in turn, are divided into districts and offices. The total number of field offices is now 100. There are DCAS personnel either assigned to or regularly visiting virtually every industrial community in the country.

The volume of business has been much larger than was anticipated when the new organization was still in the planning stage. Much of this increase is, of course, directly attributable to Vietnam but, nevertheless, some of the figures are significant:

- By the end of the first full month of operation (December 1965), the number of contracts under administration was already 20 percent above the planning figure. At that time, the number of primary and secondary contracts being administered was 138,000. This is projected to increase to 276,000 by June 1968.

- In December 1965, quality assurance personnel were inspecting and releasing material for shipment at the rate of \$13.7 billion annually. The annual rate projected for June 1968 is \$21.7 billion. The quality assurance cost has dropped during this period from \$6.37 per thousand dollars worth of goods shipped to less than \$4.75 per thousand.

- Contractor invoices are being processed for payment at a rate of more than 150,000 per month. In January 1968, these payments amounted to almost \$1.6 billion.

The transition from separate Service organizations to a new unified organization presented a very real challenge. Problems emerged which were significant; which demanded rapid solution; and which, while not always so, were in many instances interwoven with other problems. These included major realignment of responsibilities, new communication channels, disruption of long standing relationships between individuals, offices and industry. Added to these problems was the necessity to eliminate imbalance of skills in the work force, redistribution of

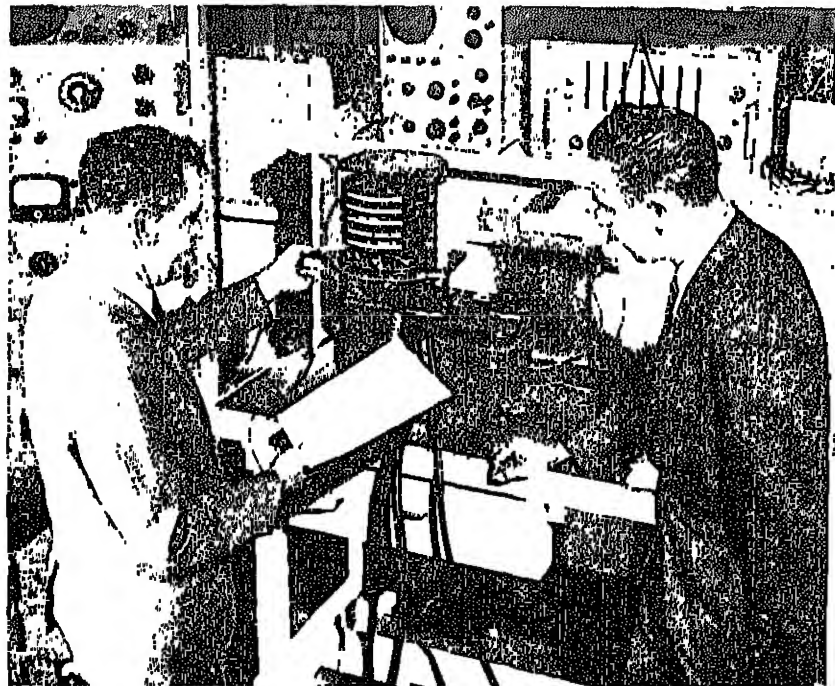
manpower, and preparation and implementation of uniform procedural manuals. Any single one of these problem areas could be challenging in its own right, but in concert they were formidable. Despite the enormous task already in being, another factor contributed to the sense of urgency that had permeated DCAS for the past two years. In addition to the normal pressure on a new organization, the increased tempo of operations in Vietnam and Southeast Asia greatly magnified the number of contracts to be administered, and imposed tighter demands on adherence to delivery schedules. As the operating forces drew down existing stocks, the urgency for additional support from industry increased. The requirements for expediting action, priority production, and emergency shipments increased, while quality standards had to be maintained.

Contract administration services has been defined as:

Technical and administrative services in support of buying organizations performed at or near contractor establishments to fa-

cilitate contract performance and assure compliance with the terms and conditions of government contracts.

This is an oversimplification. The Project 60 Study Group was able to identify 230 separate functions which are part of contract management. The 24,000 DCAS personnel must cover a wide spectrum of these functional responsibilities. The largest group, almost 10,000 or about 41 percent of the total, are engaged in quality assurance activities. Most of the quality assurance technical people are representatives who are in day-to-day contact with the contractors. They are backed up by engineers and product specialists who are available when new or unusual problems arise. The defense products being manufactured today are so diverse and complex that many DCAS quality assurance personnel, who at one time had only one technical specialty such as electronic or mechanical commodities, now have developed a second or even a third skill. This is encouraged so that versatile, high-grade personnel are geographically dispersed to react quickly to contractor requirements.



Quality assurance representative of Defense Contract Administration Service Region, Los Angeles, at Acoustica Associates, Inc., Los Angeles, conducting an acceptance test with Acoustica's quality control manager on the Propellant Utilization System Computer used on the Atlas Agena missile.

Collectively, DCAS personnel probably constitute the nation's greatest concentration of "know how" concerning the capacity, capability and problems of American industry. DCAS management and technical personnel are on-site in contractors' plants having contracts for complex systems, such as the National Aeronautics and Space Administration man-on-the-moon life support package. A DCAS quality assurance representative in a California contractor's plant is in constant touch with the U.S. Air Force Athena program. Whether the contract is for a two-ton floating crane, certain types of aircraft, re-entry vehicles, nuclear components, chemicals, medical supplies, textiles, books, or any other commodity, there is certain to be a DCAS representative on the scene.

About one-fifth or 4,600 of DCAS personnel are performing functions grouped under the general heading of contract administration. It is basic to DCAS policy that every member adopt a "team" approach to industry. Since the contract itself provides the framework within which all aspects of the relationship must fall, the administrative contracting officer (ACO) is the logical captain of the DCAS team.

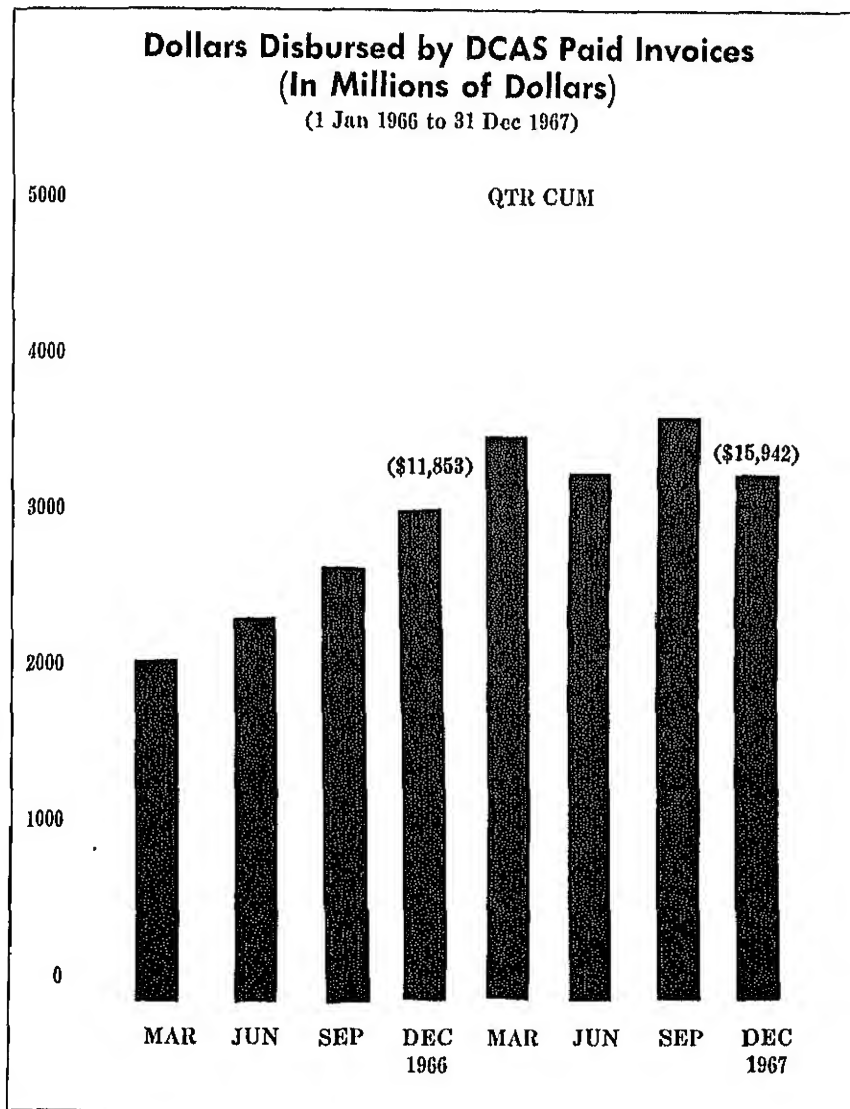
Another 3,200 people are in various production activities. The real purpose of these activities is to provide industry every possible assistance. This extends from the pre-award surveys, which seek to determine whether there are reasons that make it undesirable for a contractor to accept a contract, through effort to help with production problems, facil-

ities problems, or any other matter having to do with the manufacture of the goods being procured.

Our nation has a very real interest in maintaining as broad a defense industrial base as possible. DCAS has an obligation to seek out new producers who have a capability of producing quality materiel at competitive prices. Specifically, one of the functions assigned to field activities is "service to the public with special emphasis in obtaining Government contracts". In each DCAS Region and in most districts, there are small business specialists whose services are available to any business, large or small. These specialists are knowledgeable of procurement regulations as well as the procurement plans of the Defense Department. They seek to channel all interested representatives of business and industry to the appropriate buying center, or to a prime contractor if it appears that the enterprise in question is a logical contender for a subcontract.

Another group of about 2,400 people are involved in systems and financial management activities. The main concern of this group are such things as contract changes, shipping instructions, pre-award surveys, inspection and receiving reports, and many other documents essential to the expeditious prosecution of the business of military procurement. It is essential that these data move swiftly and accurately, and to accomplish this DCAS uses electronic means of data transmission whenever possible.

Soon to become a reality in DCAS operations are two programs designed to greatly speed up transmission of information. One of these is called MILSCAP (Military Standard Contract Administration Procedure). The other is a project called Mechanization of Contract Administration Procedures. When these two programs are fully implemented, most of DCAS activities will be conducted through a network of computers, and the delays occasioned by the present necessity of transmitting much data in hard copy form will be eliminated. Most data required by the contractor, the contract administrator, the buying office and the user will be forwarded to each automatically, and much more rapidly than at present.



Should the need for a special inquiry arise, the standardization of information and the compatibility of the data processing equipment will permit instantaneous response.

Many of the contracts DCAS administers deal with matters having a security classification. DCAS has been assigned the mission of maintaining appropriate security safeguards not only for contracts administered by DCAS, but for all contracts awarded by DOD, and for contracts awarded by other government agencies.

Approximately 900 DCAS people are engaged in the industrial security function. They inspect and issue security clearances for contractor facilities. They monitor contractor security programs and procedures. They evaluate the ability of contractors to safeguard classified information on a world-wide basis. They process approximately 400,000 requests per year for individual security clearances. The objective is to provide defense contractors with accurate and understandable guidance as to their security obligations so that effective protection of classified information is assured as economically as possible.

Another group of about 150 DCAS personnel is charged with responsibility for implementing the provisions of Presidential Executive Order 11246. The Executive Order requires that, in work performed under government contracts, there must be no discrimination on the basis of race, creed, color, or national origin, and that there must be affirmative action to produce equal opportunity of employment. This function, called Contract Compliance, was transferred to DCAS from the Office of the Assistant Secretary of Defense (Manpower) on July 1, 1967. The Contract Compliance group conducts Compliance Reviews, Follow-up Compliance Reviews, Pre-Award Compliance Reviews, and Investigations of Complaints of Discrimination. Approximately 50,000 Contract Compliance reports (SF-100) were received by the 11 DCAS regions during the last six months of 1967.

One might say that this merely implements national policy and, therefore, it should be a simple and straightforward matter. It does not always turn out that way. There is generally no basic disagreement as to the objectives. Most Americans sub-

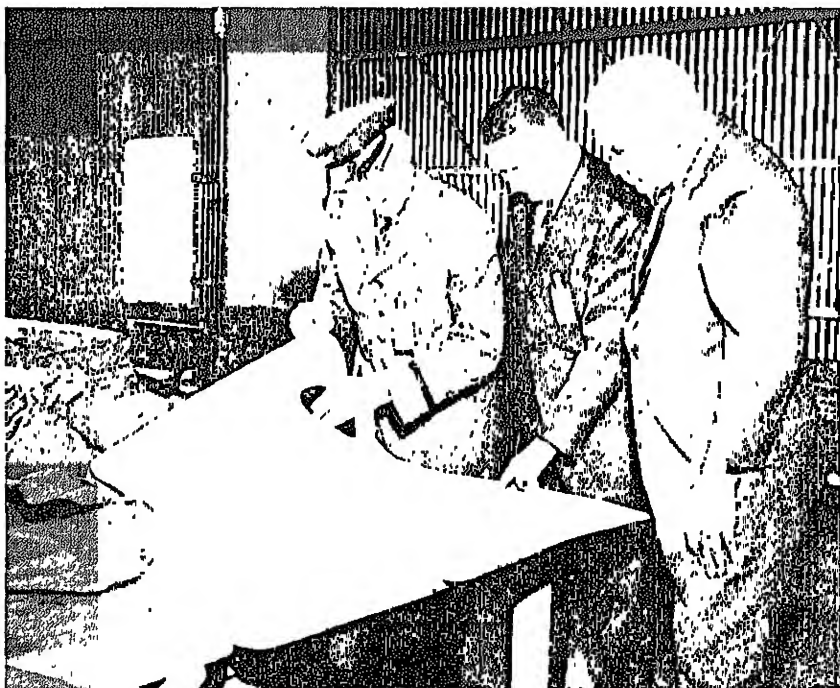
scribe to the desirability of fair recruitment and selection practices, fair promotion policies, and collective bargaining relationships. There is no disagreement that minority groups, the underprivileged, the handicapped and the disadvantaged must have an opportunity to become productive persons.

Where there is disagreement is in the selection of the means by which these objectives are to be reached. DCAS Contract Compliance personnel are specialists in their field. They have worked with employer associations, with union councils, minority group organizations, private and public employment agencies, and with interested segments of municipal, state and Federal Government. Based on this experience and other experience gained in working with many contractors, when these DCAS specialists conduct a compliance review or investigate a complaint, they are usually able to quickly identify problems and to make recommendations for their resolution. Despite the sensitivity of this responsibility, DCAS

recognizes that it impacts upon the tranquility of our communities and the stability of our nation, and responsibility for this program is taken very seriously.

As DCAS has gained experience it has continuously found new ways to provide better administration of contracts at lower cost. In this search for better methods, enthusiastic support has been received from the Military Services, DOD, DSA, and from industry.

A standard pattern of delegation for contract administration, the policy for assignment of contracts for administration, was issued by the Assistant Secretary of Defense (Installations and Logistics) in February 1964. The initial policy was necessary to facilitate understanding between DCAS and the Military Departments. This pattern specified standard responsibilities when a contract is delegated to DCAS for administration. Additional responsibilities may



At Watts Manufacturing Co., Watts Los Angeles, government-industry trio review production flow plan for manufacture of hospital tents for Defense Personnel Support Center.

be added at the option of the procurement organization.

Changes in this pattern have been developed and accepted during the past two years. Examples of delegations assigned to DCAS include engineering support, safety surveillance of hazardous and dangerous materials, and the administration of medical supply contracts. Defense Procurement Circular (DPC) No. 58 clarifies and clearly delineates the contract administration services responsibilities to be performed by DOD contract administration offices. Further, DPC No. 58 is specific in defining the contract administration functions that are to be performed by contract administration offices, and defines the types of contracts which purchasing offices may retain for administration.

During 1967 the Armed Services Procurement Regulation (ASPR) Contract Administration Panel succeeded in having standard regulations published in numerous contract administration areas, such as inspection and acceptance, inspection and receiving reports, property administration and contract files. Standard procedures were also approved for contract terminations and property disposal. In process are cases developed by the panel in other areas, such as transportation, production surveillance, and reporting and utilization of industrial plant equipment.

The Corporate Administrative Contracting Officer (CACO) program was implemented in several DCAS regions during 1967. This program entails the assignment of an administrative contracting officer (ACO) to

be cognizant of the contractor's corporate level organization. A single ACO, in a region, is assigned the responsibility for the review and approval of policies and procedures having impact upon subordinate contractor organizations.

The Contractor's Weighted Average Share in Cost Risk (CWAS) program was implemented by DCAS regions during 1967. The program encompasses:

- A technique for determining the contractor's assumption of cost risk for a given fiscal year through an analysis, by contract type, of costs incurred.

- The establishment of a threshold level for the relaxation of the requirement for determination of the reasonableness of certain overhead costs.

An automated reporting system monitors approximately 340 ammunition components for the use of the U.S. Army Munitions Command in scheduling ammunition loading plants, shipping facilities and transportation for munitions critically required in Southeast Asia.

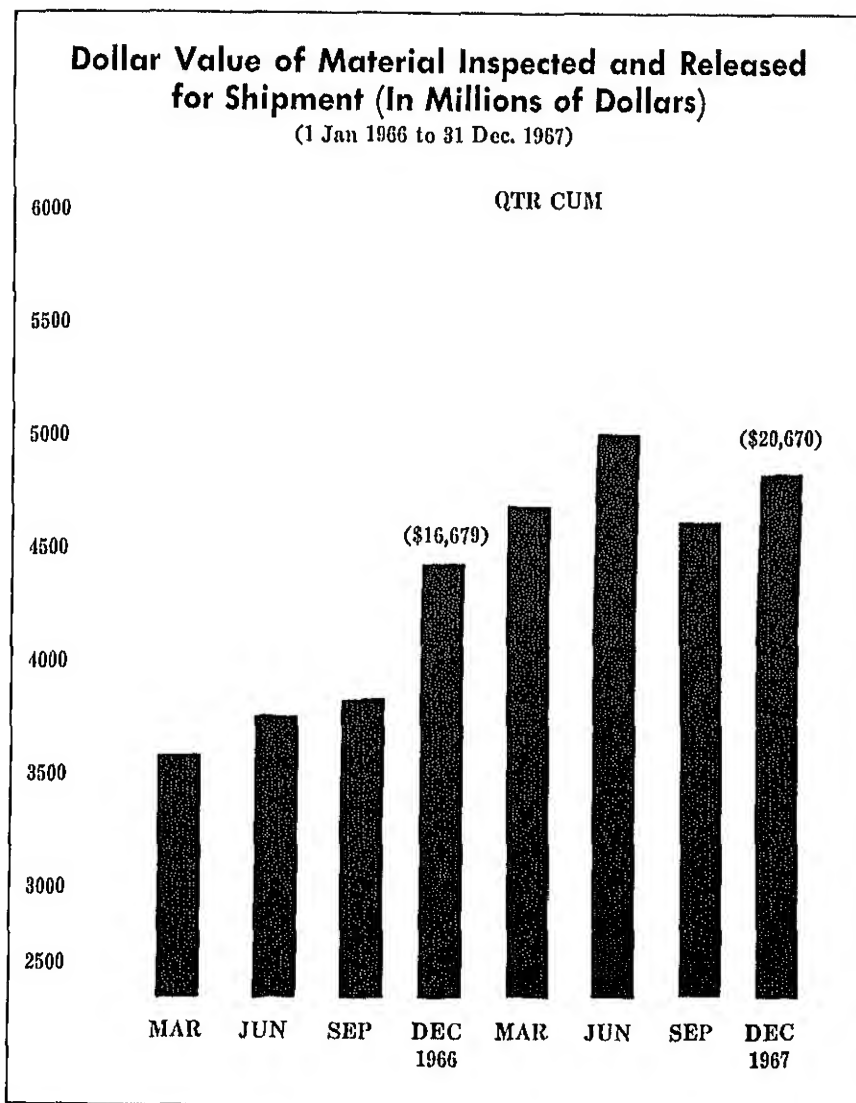
A special emphasis program was initiated on selected contracts for government-furnished equipment in the Accelerated Strike Aircraft Program. By the end of 1967 detailed status reports were being furnished the Naval Air Systems Command monthly on approximately 195 contracts.

Special production monitoring continues to substantially reduce the number of DSA-managed items in critical stock positions.

The first three-volume publication of the Register of Planned Emergency Producers was distributed in April 1967. The register lists 13,000 facilities and/or plants indicating a willingness to produce critical items under emergency conditions. Listings are published alphabetically, geographically, and by Armed Services Procurement Planning Offices for primary distribution to the Military Departments and DSA.

During 1967 a standby plan, for use should hostilities in Southeast Asia cease, was completed and is available for immediate use by each DCAS region. It provides a readiness capability implementing an expanded termination for convenience program.

At the request of the Office of Assistant Secretary of Defense (Installations and Logistics), DCAS is devel-



oping an improved system for assuming an executive agency assignment for foreign government procurement support. The new system will provide for direct communication between the foreign embassies and DCAS, and shorten the flow time for the requests.

In late 1967, DCAS initiated a series of 11 seminars for instructing government property administrators in recent changes in Armed Services Procurement Regulation relative to improving management of government-owned industrial property used for defense contracts. The seminars are being held at each DCAS region location and are being conducted primarily to train the government property administration personnel. However, industry personnel are being afforded the opportunity to participate in this instruction (see item in January 1968 issue, *Defense Industry Bulletin*, page 15).

DCAS small business specialists participate in DOD small business training sessions. This training provides them with the technical competence needed to provide local, one-step counseling guidance to small business concerns on how to do business with the Army, Navy, Air Force and DSA. Recently DCAS published a small business brochure* for use as a counseling aid in assisting small business and labor surplus area concerns in obtaining information on subcontracting opportunities available to them. The DCAS Small Business Office actively participates in the President's Committee on Employment of the Handicapped in a program to utilize sheltered workshops (for handicapped persons) as potential sources for defense items. DCAS specialists make known the capabilities of the sheltered workshops to prime contractors who, in turn, often offer them subcontracting opportunities.

To reduce specification deficiencies in procurement data packages, which frequently cause contract administration problems, a program of specification reviews has been initiated and specific recommendations will be fed back to purchasing activities.

**Free copies of the DCAS Small Business Brochure may be obtained by writing Defense Supply Agency, Code DCAS-A, Cameron Station, Alexandria, Va. 22314.*

A quality audit program has been developed to provide an independent product evaluation by personnel other than the individuals directly responsible for inspection and acceptance. These quality audits provide additional assurance that the products received by using activities conform to quality requirements. Participation by buying agency personnel is encouraged.

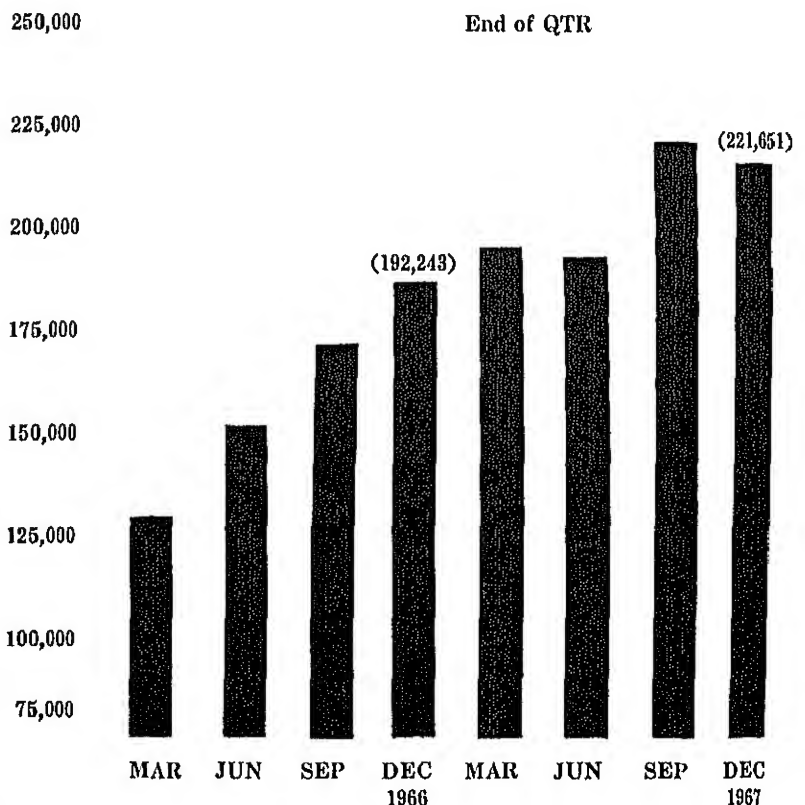
Recognizing a continuous need for liaison between DCAS, the procuring activities and contractors, a formalized Customer Relations Visit Program has been established. The goals of this program are to improve the effectiveness of personal communications between DCAS and its customer organizations; to obtain customer's views concerning the quality, effectiveness, and efficiency of service rendered to them by the

DCAS organization; and to identify those actions required for resolution of mutual problems or complaints. Over 40 buying agencies and users were visited during 1966 with an additional 30 customer relations visits conducted in 1967.

These and other efforts are all aimed at achieving the DCAS pledge of improved service on land, sea, air and certainly in Vietnam. For example, failure to provide complete support at some isolated location can present great difficulties. When a construction project is undertaken in Vietnam, every piece of equipment is essential. Very early in the game, DCAS developed a technique of coping with this problem. When a project in one of these

Number of Contracts Under Production Surveillance

(1 Jan 1966 to 31 Dec 1967)



isolated areas is identified, DCAS personnel follow production of every item required for the project as a package so that it can be delivered complete in every respect.

DCAS personnel are now inspecting materiel and releasing it for shipment at the rate of \$1.7 billion a month. This includes ammunition and weapons at an annual rate of \$2.4 billion; petroleum products, \$1 billion; electrical and electronic equipment, \$6.1 billion; missile, aircraft and space vehicle components, \$2.2 billion; and textiles and clothing, \$1.2 billion.

Vietnam has taught DCAS a great deal about new products and old products with a new look. For example, the familiar pierced steel airfield landing mat of World War II was not satisfactory. It quickly became apparent that in Vietnam there was a requirement for interlocking

steel plank with greater strength. In addition, extreme dust and mud conditions in Southeast Asia made a solid surface desirable. Three new types are now in use, one of which is approved for medium duty jet use. There is also extensive use for hard stand, revetments and other applications requiring a solid, quickly installed, durable surface. Almost \$150 million dollars worth of this new steel planking has been procured to date.

The soil, itself, has prompted use of two entirely new techniques. It has been observed that much of Vietnam is either dust or mud, depending upon the season. This situation has given rise to a requirement for large quantities of soil binder, an item for which there was little previous demand. It has been necessary to develop methods of packaging, transporting and storing large quantities.

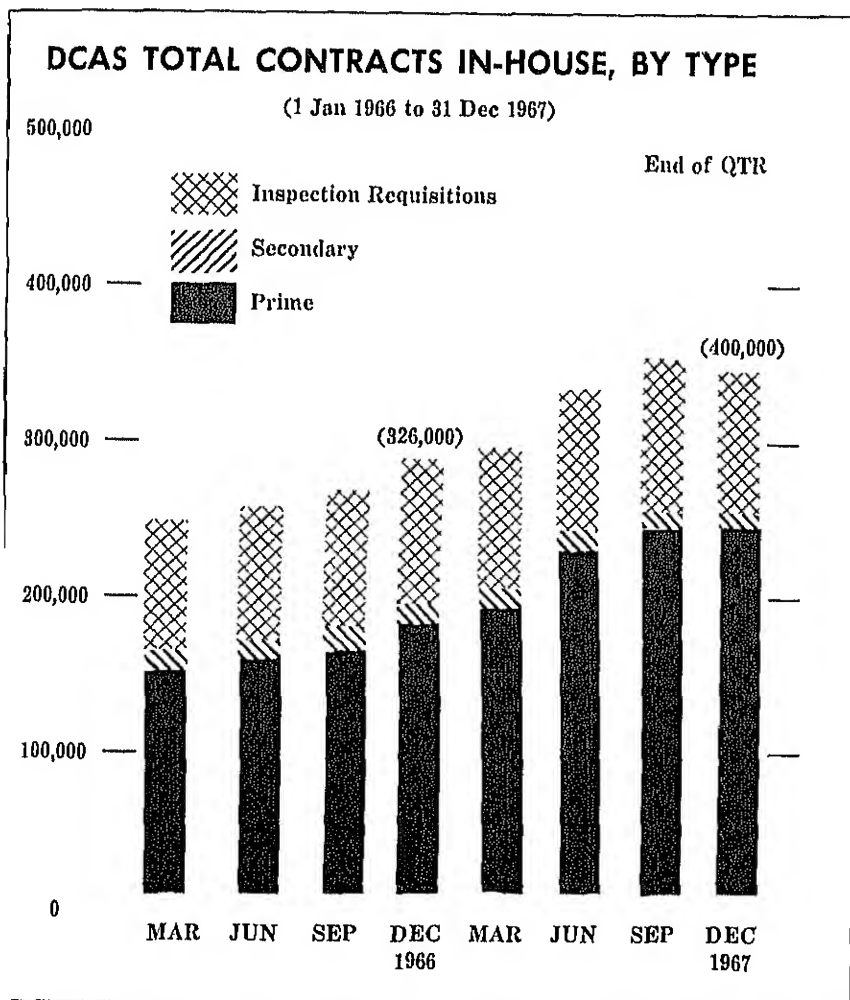
Another method of dealing with unstable terrain is the use of large areas of waterproof membrane which can be spread over the ground. This may well prove to be an important means of rapidly securing an area and operating within it.

As stated earlier, the volume of materiel being inspected is now well over \$20 billion a year. However, the dollar volume tells only a small part of the story. DCAS has brought many new producers into the defense program. Even such things as uniforms, shoes and textiles, when they are destined for use in Vietnam, demand that the manufacturer be educated and made sensitive to the conditions under which they will be used. The same can be said for electronic components of all sorts. A component, which may perform admirably in a television set in a living room, may fall far short of the reliability required if it is destined for the climate and terrain of Southeast Asia, or for one of the space programs which DCAS is supporting.

DCAS is a young organization and has grown in a period of rapid build-up of procurement. In many areas, the DCAS workload increase has exceeded 100 percent in less than three years. At the same time, personnel strength has increased less than 20 percent. Yet the job is being done effectively.

Even more important is the flow of support that is reaching Vietnam. In the initial stages of any operation of this magnitude, one might reasonably expect serious shortages of material and serious problems with quality and reliability. The record is not perfect, but it is difficult to conceive that anyone would contend that logistic support of our military effort around the world has been other than ample and on time. This achievement could not have been attained without the cooperation and support DCAS has received from industry and from DOD and other government agencies.

Had he been a contemporary, perhaps Rudyard Kipling would have added a few more stanzas to "Boots-infantry columns."



Defense Contract Administration Services Regions (DCASR)

DCASR, Atlanta Col. L. P. Murray, USAF
3100 Maple Drive NE Commander
Atlanta, Ga. 30305
Phone: (404) 261-7310

Provides contract administration services on a wide variety of products ranging from heavy electronics to clothing and textiles, munitions, missiles, aircraft and space components, chemical, petroleum and medical supplies.

DCASR, Boston Col. F. A. Bogart, USA
666 Summer St. Commander
Boston, Mass. 02210
Phone: (617) 542-6000

Products being administered include clothing, textiles, petroleum products, medical supplies, ammunition, weapons and weapon systems, jet engines, sonar and radar systems, infrared detection and spectroscopy, helicopters, optical equipment, and highly complex electronic systems for the Apollo, Poseidon, Saturn and LEM programs.

DCASR, Chicago Col. J. P. Gibbons, USAF
O'Hare International Airport Commander
P. O. Box 66475
Chicago, Ill. 60666
Phone: (312) 694-3031

Has commodity responsibility in electronics, including communications equipment and radar sets; ammunition; clothing, such as uniforms, G-suits and armored vests; and mobility equipment ranging from forklift trucks and bridge launchers to tape-controlled plant machinery.

DCASR, Cleveland Col. N. T. Dennis, USA
1240 E. Ninth St. Commander
Cleveland, Ohio 44199
Phone: (216) 522-5268

The number of contracts administered by this region covers the complete spectrum represented by DOD procurement, i.e., food to combat vehicles, clothing to jet engines and space hardware.

DSASR, Dallas Capt. W. G. Normile, USN
500 S. Ervay St. Commander
Dallas, Tex. 75201
Phone: (214) RI 9-2375

Within the overall DOD programs coming under the administrative responsibility of this region are such critical items as aircraft, bombs, bomb fins, textile and clothing, POL and electronics. Ammunition contracts administered include items ranging from anti-personnel bombs up through 500- to 750-pound bombs.

DCASR, Detroit Col. K. Johnson, USA
1580 E. Grand Blvd. Commander
Detroit, Mich. 48211
Phone: (313) 923-0100

The main area of commodity responsibility lies in the automotive field with the greatest number and dollar value of contracts for commercial and tactical vehicles, engines, tires and spare parts. One of the major weapon systems under administration is the

new MBT-70 main battle tank, a joint effort of the United States and the Federal Republic of Germany. The DCAS office in Ottawa, Canada, acts as the DCAS "go-between" with the Canadian government on contract administration matters.

DCASR, Los Angeles Brig. Gen. A. E. Exon,
11099 S. La Cienega Blvd. USAF,
Los Angeles, Calif. 90045 Commander
Phone: (213) 643-1000

This region's major area of commodity responsibility concerns development and production of electronics equipment. It is deeply involved in the administration of the National Aeronautics and Space Administration's contracts held by the aerospace industry.

DCASR, New York Brig. Gen. W. M. Vann,
770 Broadway USA,
New York, N. Y. 10003 Commander
Phone: (212) 677-3030

The list of products under this region's surveillance is almost limitless. A partial listing would include radar, computers, communication and tracking systems, re-entry vehicles, nuclear components, wheeled vehicles, ammunition, propellants and explosives, nuclear ordnance, missiles and spacecraft, chemical products, medical supplies, petroleum, textiles, books and optics.

DCASR, Philadelphia Col. G. Johnson, USA
P. O. Box 7478 Commander
Philadelphia, Pa. 19101
Phone: (215) 271-4011

This region administers approximately 35 percent of all fuse contracts procured for the Military Departments. Other major commodity responsibilities include a variety of all types of ammunition, arming devices, five types of personnel carriers, space suits for the Apollo program, and aircraft landing mats and landing devices.

DCASR, St. Louis Capt. R. S. Sullivan, USN
1136 Washington St. Commander
St. Louis, Mo. 63101
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The area covered by this region ranges as far west as Wyoming and as far north as Minnesota. Major commodity responsibilities are in the electro-mechanical, aircraft and ordnance support areas covering such items as jet aircraft, guided missiles and rocket launchers.

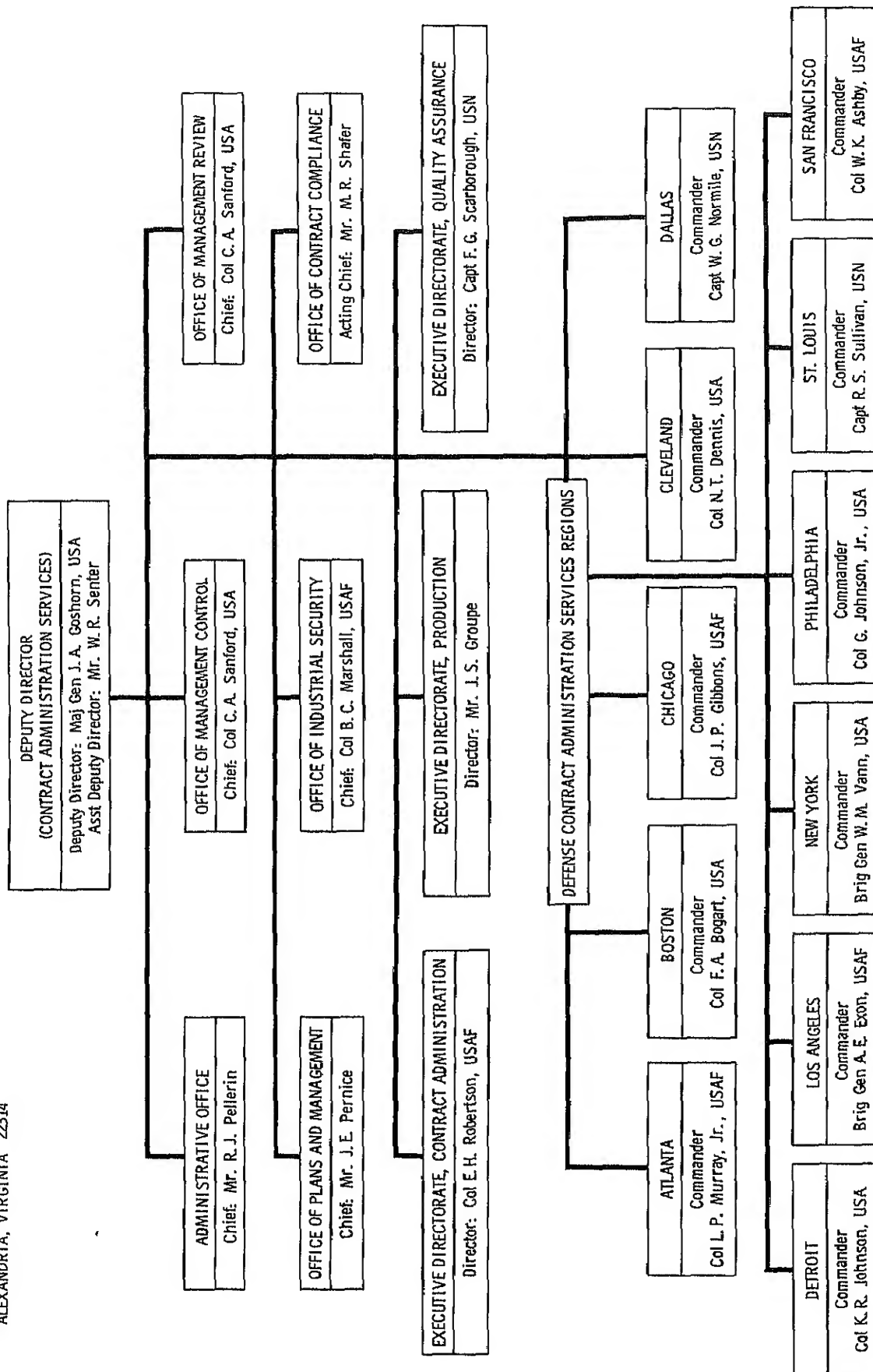
DCASR, San Francisco Col. K. Ashby, USAF
866 Malcolm Rd. Commander
Burlingame, Calif. 94010
Phone: (415) 692-0300

The geographic area covered by this region includes Alaska, Hawaii, the Mariana Islands, and the Marshall Islands. This region accepted the communications satellites to be placed in orbit to provide private communications channels for U. S. installations world-wide; accepted enough Armed Forces rations to load an 18-mile-long train; and accepted vast quantities of cement shipped from Hawaii.

DIRECTORY OF

DEFENSE CONTRACT ADMINISTRATION SERVICES

DEFENSE SUPPLY AGENCY HEADQUARTERS
CAMERON STATION,
ALEXANDRIA, VIRGINIA 22314



Defense Communications Interface with Commercial Carriers

Renato Tramontano

The Defense Department annually invests about \$1.5 billion for telecommunications equipment and spends about \$360 million for commercially leased communications circuits, networks and equipment.

Telecommunication, as defined by international agreement, is: "Any transmission, emission, or reception of signs, signals, writing, images, and sounds of intelligence of any nature by wire, radio, visual, or other electromagnetic systems." Telecommunication includes:

- Telephone, telegraph, and data circuits and their associated processing, switching and terminating devices.
- Satellite communications.
- Radio, radar and navigational aids.
- Microwave, tropospheric scatter, cable, and landline systems.
- Electronic countermeasures equipment.
- Cryptologic and telemetry systems.
- Television and display facilities.

The DOD interface with commercial carriers for the management of leased communications is the Defense Commercial Communications Office (DECCO), at Scott AFB, Ill. DECCO, a field activity of the Defense Communications Agency (DCA), does the biggest commercial

management job
DECCO paid
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(CONUS), DECCO is responsible for DOD leased services in Hawaii and Canada, and for international circuits emanating from the United States and its possessions. DECCO leases

circuits in transoceanic cables to Hawaii, Guam, the Republic of the Philippines, Japan, Europe and the Caribbean. DECCO is responsible for procuring satellite circuits, of which more than 40 are now serving DOD. Involved in the management and negotiation for the leased services are over 300 franchised communications carriers, Federal and State regulatory agencies, and approximately 25 customers (sub-commands

of DOD) with varied defense missions.

An outstanding job of reducing the cost of leased private line service to the DOD is reflected in the DECCO validated cost reductions reported during the Initial Five-Year Cost Reduction Program ending in FY 1966 (Figure 1). Under the new DOD Cost Reduction and Management Improvement Program, DECCO's reportable cost savings for FY 1967 were \$1,202,400. The DECCO goal for FY 1968 is \$2,000,000.

DECCO

The DECCO story is one of effective management and good teamwork between DOD and the communications industry. It is the story of the successful application of management principles of consolidation, centralization, quantity procurement, and automation dedicated to improving telecommunications support to the Military Departments and Defense Agencies at the lowest feasible cost.

DECCO developed from the need for centralized management and procurement of leased communications services for DOD. In the late 1950s, command and control communications had become vast complexes attended by problems that demanded immediate solutions.

- The Cold War, with its nuclear counter strike forces, emphasized the need for information and control on a real-time basis.

- The U.S. Air Force conceived and developed the huge SAGE (Semi-Automatic Ground Environment) network, an intricate radar early warning, fighter, and missile control system guarding the North American frontier.



Renato Tramontano is a staff member of the Directorate for Telecommunications Policy, Office of the Asst. Secretary of Defense (Installations & Logistics). He also serves as Chairman, Telecommunications Sub-group for the DOD Cost Reduction and Management Improvement Programs.

The author gratefully acknowledges the assistance of Col. B. U. Glettler, USAF, Chief of DECCO, and his staff, particularly Mr. Glenn Boyer, for their invaluable contribution.

• Complicated digital logistics communications networks also grew rapidly to support the various weapon systems.

The communications requirements for these sophisticated attack and defense weapon systems were a challenge to the ingenuity and productivity of the military users and the industrial producers. The biggest question was: "Where are we going to get the communications equipment and skills necessary to tie these widely dispersed operations to a single directing agency?"

For the answer, the Air Defense Command (ADC) turned to the telecommunications industry—to the common carriers who were providing leased communications services to the Military Departments. These carriers were prepared to develop the equipment and manpower skills; they already had much of the long-line requirements in place; and they did not have the Military Services' ever-present problem of skill retention. As part of the ADC's continuing effort to improve the management of communications leasing, an office was formed to act as a central agent for

SAGE leasing transactions. This new office took three important steps that laid the groundwork for the eventual formation of DECCO.

• Communications cost analysts were employed to negotiate costs with the commercial carriers for the construction of SAGE facilities.

• Contracting, accounting and disbursing functions were automated.

• SAGE communications requirements were routed for maximum bulk rates under the Multiple Channel Tariff offered by the commercial carriers for interstate leased facility service. The Multiple Channel Tariff reduced the rates for all but the first three circuits of the same general type to the same customer between the same rate centers. As additional circuits were added, the percentage of rate reduction increased. The tariff applied to two general types of circuits—voice bandwidth and telegraph bandwidth—with separate applicability for each type and for each customer. For example, if ADC leased three voice and three telegraph circuits between Washington, D.C., and New York City, all circuits would be priced at normal rates. However, if

a fourth voice circuit was added by ADC between the same two points, that circuit would be priced at about 10 percent less than each of the other voice circuits. The cost of the original circuits remained the same. Any additional circuits would be added at progressively reduced costs.

The success with which the ADC office reduced the cost of telecommunications for the SAGE program, and also the management overhead costs for both ADC and the commercial carriers, influenced ADC to centralize all its leased communications activities at Colorado Springs, Colo. This consolidation created a single leasing office large enough to exploit the Multiple Channel Tariff rates of the communications carriers.

In 1960 the ADC centralized leasing activity was placed under the jurisdiction of the Air Force Airways and Air Communications Service to become the nucleus of an Air Force-wide manager for long-lines communications leasing. The Air Force-wide leasing activity became known as the Office of Commercial Communications Management (OCCM) and, in late 1961, was moved to Scott AFB, Ill., as a staff element of the newly created Air Force Communications Service.

At this time each of the Military Departments had established a central point for leasing commercial services. Previously, as many as 25 military customers of the commercial carriers were separately leasing communications services, without considering the leased facilities of other Military Departments or commands.

A DOD study determined that there should be a central point for leasing private line circuits for all elements of DOD, and designated OCCM as the interim activity to perform the function. Centralized management of communications leasing assumed even greater significance with the introduction of the new TELPAK tariff by the major U.S. communications common carriers. By January 1962, integration of all the leased records of DOD activities had been completed. On Dec. 31, 1962, OCCM was redesignated as the Defense Commercial Communications Office (DECCO) and became an activity of the Defense Communications Agency. This reorganization established DECCO as the DOD commercial lease manager.

Initial Five-Year Cost Reduction Program (DECCO Savings)

FY 1962	\$ 7,500,000
FY 1963	15,889,726
FY 1964	58,200,000
FY 1965	89,400,000
FY 1966	114,800,000

Figure 1.

TELPAC Schedules

Schedule	Voice Circuit Capacity	Cost Per Mile Per Month
*A	12	\$15.00
*B	24	20.00
C	60	25.00
D	240	45.00

* Effective Aug. 1, 1967,
Intrastate Offering Only

Figure 2.

TELPAK

TELPAK is the trade term for a "telecommunications package deal." It is not a physical package, pipeline, or conduit. It is a pricing arrangement for the routing of groups of circuits. The average circuit in such an arrangement travels through 10 TELPAKs between its origin and its termination. For example, between Washington and New York, DECCO could lease 20 different TELPAKs with AT&T for Bell System north/south circuits along the East Coast. Figure 2 shows typical costs of these TELPAKs.

Schedule A TELPAK, the smallest offered, contains up to 12 voice-grade circuits. For the same cost, the user can replace the voice circuits with 144 teletype circuits, or 72 Class D data circuits, or 48 Schedule 3A data circuits, or 1 wideband service, or any combination of circuits which equal 12 voice grade channels or less. Schedule B and C TELPAKs have a capacity for 24 and 60 voice circuits, respectively. Schedule D provides the most economical pricing and the greatest savings on a per-mile basis. Schedule D, the largest TELPAK offered, provides up to 240 voice circuits, or 2,880 teletype circuits, or a combination of voice, teletype, data, video, and wideband circuits. The major part of the DECCO network is made up of D TELPAKs.

Whenever possible, every circuit ordered in the United States by DECCO from commercial carriers is routed in TELPAK. Often a circuit must be priced partly in TELPAK and partly on an individual type basis, commonly referred to as Interexchange Service (IXC). In the event a circuit cannot be accommodated with full TELPAK application upon installation, DECCO has the IXC mileage flagged in its computer. The mileage is reviewed each month to see if further TELPAK applications are possible. DECCO has applied TELPAK to approximately 87 percent of the CONUS circuits.

Centralized Procurement

The TELPAK tariff specifies that only one agency will issue the contracting order for a TELPAK to the commercial carrier. However, the tariff permits more than one U.S. Government agency to participate on a shared basis.

Other Federal Government agencies have observed with increasing interest DECCO's success in reducing DOD's cost for leased commercial communications. Late in 1962, the Bureau of the Budget (BOB), the Defense Department, and the General Services Administration (GSA) agreed that DECCO would lease private line circuits for the Federal Aviation Administration (FAA). During the first year of operation, FAA reported savings of about \$2 million.

Shortly thereafter, GSA arranged to share TELPAKs whenever it is to the advantage of both DOD and other government agencies to do so. The carrier simply splits the billing between the two agencies according to a designated percentage. Figure 3 shows GSA's participation in TELPAK procurement is already running into millions of dollars. Figure 4 re-

flects the savings earned through bulk procurement. The activation and expansion of many of the DOD communications systems, such as AUTO VON (Automatic Voice Network) and AUTODIN (Automatic Digital Network), have more than quadrupled the TELPAK circuit mileage since 1963, while the monthly cost has only slightly more than doubled.

Improved Management

Centralization has led to greater cooperation and understanding between DECCO and the communications industry. DECCO has initiated administrative practices and procedures that have resulted in savings for industry and which have, in part been reverted to the Government in the form of reduced rates or cost savings.

DECCO today is computer-oriented Processing a customer's request for

GSA Participation in Joint TELPAKs

	TELPAK Route Miles Allocated	Monthly Cost
July 1963 -----	1,060,170	\$ 244,776.36
January 1964 -----	1,101,119	340,759.00
January 1965 -----	3,419,801	813,767.00
January 1967 -----	6,168,475	1,324,693.75
July 31, 1967 -----	6,421,265	1,385,482.23

Figure 3.

DECCO Participation in Joint TELPAKs

	Miles Voice & Telegraph	Monthly Cost
January 1963 -----	3,227,790	\$1,372,385.00
January 1965 -----	8,843,494	2,245,089.00
January 1967 -----	12,782,061	2,873,703.59
July 31, 1967 -----	13,130,846	2,872,311.55

Figure 4.

a service or for a change in service has been reduced to a simple Inquiry/Quote/Order cycle. The inquiry is DECCO's request for bids; the quote is industry's response; and the order is the contracting action. Behind this cycle are the basic agreements with the carriers. A customer's requirement is procured by the issuance of a Communications Service Authorization (CSA) against a Basic Agreement which had previously been negotiated with the carrier providing the service. Financial data are established automatically by the computer using the inservice dates of CSAs printed by the computer.

Currently, 260,000 records are maintained in the computer's financial master file. Validation of bills, also a computer operation, has had a definite bearing on cost reduction. In the past, at least 30 days would elapse between the time a bill was received and the date it was paid. Automation has reduced the processing time to two days. DECCO administers over 55,000 accounts for which separate bills are received each month. Almost 25,000 of these bills are submitted on punchcards. When the information on these cards matches the account payable information on file in the computer, payment is authorized automatically. Ninety-eight percent of such bills received by DECCO are paid automatically.

The advantage to industry of rapid payment is obvious. Less obvious, but even more important to the Government, are the savings that accrue as a result of prompt payment. Vital working capital is quickly returned to industry whose overhead costs are thereby reduced. Since the Federal Communications Commission (FCC) governs the industry's profit, such cost reduction is returned in part through rate reductions.

Specialization has also permitted DECCO to provide pertinent data and testimony to support the government's position in the rate reduction hearings before the FCC. DECCO negotiates directly with the carriers for rate reductions, or initiates action through DCA for investigation by the FCC and state regulatory bodies. Substantial cost savings have resulted from such actions.

DECCO's growth, including its new operation in Hawaii, has not been accompanied by a corresponding increase in manpower and support costs. Instead, the number of operating personnel has actually decreased from a high of 298 to the present 268, and during FY 1967 a reduction of \$35,000 in overtime costs was effected.

DECCO-Pacific

Centralized management of commercial communications leasing was introduced to the Pacific area with the lease of the AUTOVON switch in Hawaii, and the subsequent establishment of the DECCO-Pacific office in October 1966. Since its activation, DECCO-Pacific has reported \$300,000 in cost reduction. The cost reductions are attributable to automation, reduced manpower requirements, and consolidated procurement.

During 1968, the government-owned, on-island trunking network in Hawaii will be transferred to the local communications carrier and the Government will lease needed services as required through DECCO-Pacific. Substantial reductions in manpower and operating funds, as well as improved service, may be expected from this action. A cost comparison study is being conducted to determine the cost effectiveness of transferring government-owned base, camp, and station private branch exchanges and other telephone facilities in Hawaii to the commercial carrier for operation and maintenance.

DECCO's Goals

DECCO has met the challenges of rapidly expanding technology, and has effectively applied central management of communications leasing to provide impressive cost savings.

Looking to the future one can see at least two vital areas for further economic gains: new or improved methods of leasing communications services, and ever-increasing applications of computers and other automation devices to telecommunications services. Improving communications leasing operations and reducing costs are continuing DECCO goals.

Sentinel Defense System Materiel Support Command Created

The U.S. Army is establishing a materiel support command as part of the organization for deployment of the Sentinel missile system, a Communist China-oriented defense against intercontinental ballistic missiles.

Headed by Brigadier General Mahlon E. Gates, the Sentinel Materiel Support Command will be one of the major subordinate commands of the U.S. Army Materiel Command.

The broad mission of the new command is to provide logistical support to the tactical equipment comprising the Sentinel system. This mission will involve providing repair parts support, depot-level maintenance, and national maintenance point services to the Sentinel system sites, including rapid movement of parts to these sites.

Temporary headquarters for the command are located in the Nassif Building in Bailey's Crossroads, Va., four miles from the Pentagon.

OCD Offers One-Week Course to Industry

A series of one-week courses in Industrial Civil Defense Management is being offered by the Office of Civil Defense Staff College in Battle Creek, Mich.

The course, which has no tuition fee, is open to all business and industrial executives who have responsibility for civil defense planning in industrial plants, institutions, and other large buildings and facilities.

Instruction consists of information and technical guidance in preparing for business, commerce and industry survival, and continuity of production in the event of an enemy attack or major natural disaster.

The next course will convene Aug. 26, 1968. Other courses are scheduled for No. 18-22; Feb. 3-7, 1969 and June 16-20, 1969.

For information and enrollment forms, contact local or state Civil Defense Directors, or write to the Assistant Director of Civil Defense, Industrial Participation, Office of Civil Defense, Department of the Army, Pentagon, Washington, D.C. 20310.

Equal Employment Opportunity Extends to Religion

Honorable Alfred B. Fitt

Executive Order 11246, issued by President Johnson in 1965, requires that all persons doing business with the Government provide equal opportunities in employment and personnel practices without regard to "race, creed, color and national origin." It further requires that contractors take *affirmative action* to comply.

Secretary of Labor W. Willard Wirtz has overall responsibility for carrying out this order, but everyone should understand that it clearly applies to all contracts with the Defense Department.

Last November Secretary Wirtz issued a memorandum, "Obligations Involving Religion," to all equal employment opportunity agencies in the Government, including the Department of Defense. The text reads, in part:

Contracting agencies are reminded that the nondiscrimination and affirmative action provisions of Executive Order 11246 apply equally to problems of employment concerning *creed* as to those concerning race, color, and national origin. Although Government contractors have made progress in affording employment opportunities without regard to religion, there remain industries and companies in which some religious groups, notably Jews, and to some extent Catholics, are still excluded from positions at certain levels of responsibility. Where this appears to be the case, Government contractors are expected to identify the problems and institute appropriate affirmative actions to obtain results.

Agency compliance programs should provide the specialized coverage necessary to ensure that these requirements are being met.

There are several reasons why religious discrimination in American industry received little attention until recently. One reason is a relative lack of data on the subject. (The Equal Employment Opportunity report form now in use, for example, does not request data on religion, as it does on race, color and national origin.) Another reason is that such discrimination is certainly a less acute social problem than racial bias, and usually occurs, if at all, in upper management echelons.

Nevertheless, there is clear evidence that members of some religious groups are significantly under-represented in the executive suites of many large American corporations, with no

apparent explanation except religious bias. Most of the available data and research in this area deal with discrimination against Jews, but many of the findings are applicable to other religious or ethnic minorities.

Large businesses generally recruit junior executives at undergraduate colleges, often preferring graduates of Ivy League colleges. Jews account for about 8 percent of college graduates up to the age of 50 in the United States, for about 15 percent of Ivy League graduates, and approximately 25 percent of Ivy League graduates in the past 6 or 7 years. Yet, research analyses of management personnel in major corporations and industries, published by the American Jewish Committee over the past 10 years, have consistently shown a representation of Jews under 1 percent. A University of Michigan study noted:

... every serious effort to collect data on this subject has yielded the same general conclusions. In recent years, for example, Jews have comprised 12 to 15 percent of the graduating classes of the Harvard Graduate School of Business Administration, an institution to which the executive recruiters of many large companies regularly turn. Among the executives of such companies appearing at Harvard's seminars and training programs for businessmen, fewer than 0.5 percent were estimated to be Jewish.

Obviously it is wasteful to permit factors other than ability to influence hiring and promotion decisions, especially when there are shortages of executives in all segments of American industry.



Alfred B. Fitt is Asst. Secretary of Defense (Manpower and Reserve Affairs). A native of Highland Park, Ill., Mr. Fitt received his B.A. degree from Yale University in 1946 and was graduated from the University of Michigan Law School in 1948. He is a member of the State Bar of Michigan, Detroit Bar Association, American Judicature Society and Federal Bar Association.

Research investigations into the extent, nature and causes of employment discrimination against Jews in management have been conducted by the Graduate School of Business Administration at Harvard, by Cornell University, and by the Survey Research Center of the University of Michigan.

Harvard explored the techniques for recruiting executive trainees on college campuses, and how they often serve, deliberately or otherwise, to screen out members of minority groups.

The findings, reported in an article entitled, "The Ethnic of Executive Selection," by Lewis B. Ward, Professor of Business Research, Harvard Business School, in the *Harvard Business Review*, indicated that corporate officials are often unaware that some of their personnel men and recruiters tend to reject "anyone perceived as clearly different . . ." ". . . no one concerned really recognizes that discrimination is likely to be the outcome," Dr. Ward explained. "What appears to be needed is a change in values, not [simply] an order . . . to stop being prejudiced."

Dr. Ward's response to a claim by the personnel chief of a major manufacturer that few Jews apply for junior management jobs was:

Part of this can probably be explained by the grapevine; part from the fact that smart young men take a look at what has happened to other young men like themselves. If there are no Jews in management in the Carter Corporation [a fictitious name], a Jewish student isn't likely to waste much time in applying for a job there; it doesn't look like a promising place for a management career for him.

Hence if the Carter companies of business wish to change the pattern of their management recruiting to include Jewish trainees, they will have to take active steps, not only to bring their companies to the attention of this group, but also to present to them convincing evidence that barriers to promotion do not exist.

The Carter Corp., actually a major defense contractor, has made serious efforts to change the situation over the past three years, and has become

one of the nation's bellwether companies in non-discriminatory executive hiring practices.

The effect of religion on career choice was the subject of a related study at Cornell University. Answers to questionnaires, distributed to 30,000 male students in 135 American universities, demolished the myth that Jews do not like to work for large corporations and prefer independent enterprises or professions—an assumption about "typical Jewish" attitudes which has served as rationalization for executive suite discrimination for many years.

The Cornell study found that superior students of all faiths prefer medicine and law to business; that most of the young men who prefer business, whatever their faith, want to work in large corporations; and the "Jews and Christians probably resemble each other more in their approaches to business than in many other respects."

During the 1930s an influential and broadly applied theory of corporate management held that religious compatibility and acceptability were important for the selection of executives or junior executives.

The Survey Research Center of the University of Michigan investigated the criteria other than ability or merit—social background, graduation from a prestige college, religion—that were used today in selecting and promoting executives within a typical large corporation.

The findings showed that many executives of large businesses tend to hire and promote people with social and religious background similar to their own, and believe that emphasis on "compatibility" or "acceptability" is vital for supervisor or customer approval. One major company, for example, cited as one criterion for management employment: "Does he look like us?"

Many business leaders have recognized the need to take measures to eliminate religious discrimination from the executive suite, and many defense contractors, especially, have carried out highly effective "affirmative action" programs toward this end.

Affirmative action for equal employment opportunity means simply that a contractor with the Government

must take concrete measures to employ minority-group personnel. In practice, it means that management applies the standard operating procedures for success, the same techniques and controls it would apply to any necessary and important program. This includes an analysis of personnel practices to make certain that employees are judged only by their merit, and that no discriminatory criteria creep into the selection or promotion processes. Where there are discrepancies between policy and practice, the Executive Order requires that the contractor take corrective measures.

Standards of affirmative action apply to all types of discrimination—whether based on race, creed, color, or national origin—at all levels of employment. Since religious discrimination occurs mainly at management levels, affirmative action calls for measures somewhat different from those projected in compliance reviews for the current Defense Department contracts. Since the Standard Form 100 for equal employment opportunity does not cover religion, it may be helpful to outline some of the steps that may be taken by employers to meet the "Obligations Involving Religion" in the Labor Secretary's memorandum:

- Include colleges with substantial numbers of students of minority religious groups in recruitment schedules.
- Inform leaders of campus religious organizations about the company's non-discrimination policy.
- To help establish the non-discrimination image, involve company personnel of religious and ethnic minorities in interviewing and other recruiting activities.
- Request referrals of qualified people from religious and ethnic community and service organizations. Specialists in other companies may want, and be qualified for, policy jobs they cannot get in their own firms.
- Advertise job vacancies in publications directed to the religious and ethnic community. Send them press releases on promotions of employees.
- Review personnel records of current technical or specialized personnel. Their knowledge is often indispensable to policy making.

(Continued on Page 20)

Holloman AFB Unit Tests Navigation and Guidance Equipment

Lieutenant Colonel Leonard R. Sugarman, USAF

The U. S. Air Force's Central Inertial Guidance Test Facility (CIGTF) at Holloman AFB, N.M., adjacent to White Sands Missile Range, is a universally recognized government test complex. Officially designated the Directorate of Guidance Test, Air Force Missile Development Center, CIGTF was conceived in the Air Research and Development Command era, nurtured and matured in the Air Force Systems Command environment, and given Defense Department recognition in the schema of the Director of Defense Research and Engineering.

The CIGTF was established to provide an in-house Air Force capability to test and evaluate products of the inertial navigation and guidance industry. Specific mission goals are:

- Unbiased evaluation of components and systems to provide data from which the using agency can select the optimum equipment for a given mission application.
- Development of a single centralized test facility to avoid the prohibitive costs of duplication.
- Standardization of tests to provide common yardsticks for comparative evaluation.
- Competence in both personnel and equipment to insure meaningful reports.

Historically, CIGTF grew and attained recognition by testing boost-phase guidance systems for Titan and Minuteman ballistic missiles and Centaur and Saturn space payload launchers. These tests made use of the Holloman seven-mile long, high-speed test track. However, in 1964 test emphasis shifted to the evaluation of aircraft inertial navigators. The test methods and techniques for analytical evaluation, rigorously developed during the missile and space booster era, were applied to the validation of aircraft systems. This

growing competence resulted in increased emphasis on the CIGTF role as a natural focal point for navigation system testing. The use of the test facility by the three Military Services, the National Aeronautics and Space Administration, Federal Aviation Agency and private industry illustrates national recognition of its expertise in this area of testing with commercial as well as military applications. CIGTF programs, progress and future plans are as dynamic as the impact of their test efforts on weapon system development, procurement and production has been dramatic.

Current tests of national significance within the Gyroscope Test Branch consist of components for

the Short Range Attack Missile (SRAM), C-5A, Centaur and Self-Aligning Boost Re-Entry Systems (SABRES). In the Accelerometer Test Branch are also components for SRAM and Centaur, as well as Minuteman. Recently completing tests at the test track directorate were the Honeywell Strapdown Inertial Guidance Navigator I System (SIGN I), United Aircraft Apollo/Lunar Excursion Module Abort Sensor Assembly, Teledyne's Flight Reference Stabilization System, and Ford Instrument Co's Settable Inertial Altitude Sensor, the latter sponsored by the U.S. Army Picatinny Arsenal. Re-certification of the Minuteman NS-10 platform continues for the Air Force Logistics Command. Soon to arrive for a series of sled runs is the Marshall Space Flight Center's Advanced Saturn Single Axis Platform system. These test activities are performed with a staff of 260 government employees with almost 100 professional engineers—divided equally between the military and civil servants.

These current programs at CIGTF illustrate the two major test areas—the testing of missile guidance systems and the testing of aircraft inertial navigation systems, as well as components for these systems. As previously mentioned, the emphasis shifted in 1964 to the evaluation of aircraft inertial navigators. Along with this action, CIGTF gained DOD recognition in 1965 as the focal point for evaluation of navigators. Secretary of the Air Force Harold Brown, then Director of Defense Research and Engineering, augmented the directorate's charter in aircraft inertial navigation system validation by memorandum to the three Service Secretaries for Research and Development. Dr. John Foster, the present Director of Defense Research and Engineering, has reaffirmed that 1965 decision.



Lt. Col. Leonard R. Sugarman, USAF, is Executive Officer, Directorate of Guidance Test, Air Force Missile Development Center, Holloman AFB, N.M. He holds an engineering degree from the Massachusetts Institute of Technology and a masters degree in business administration (research & development) from the University of Chicago.

The significance of these directives becomes apparent when a comparison is made between the old and new procedures in evaluating different systems. An example is the inertial navigator for the F-111 Mark II Avionics System. Thirteen competitive systems were identified in response to the Request for Proposal from Air Force Systems Command's Aeronautical Systems Division (ASD). Previously, under the old procedure, the Air Force would have selected one of the 13 systems based on limited tests and contractor brochure data. Under the new procedure, 8 of the 13 were eliminated because they were not delivered to Holloman by the specified delivery date; and only 2 of the 5 were able to make it to the test completion date. This highly selective procedure results in minimum time in evaluating and accepting the desired system.

Tests on guidance and inertial navigation systems are conducted in four locations: in the laboratory, on the 35,588-foot test track, in a specially equipped portable van, and in aircraft (both cargo and fighter types).

Laboratory testing complements the other test methods, such as sled, aircraft and van. The tests range from humidity to acceleration. The outstanding feature of the laboratory program is the ability to automatically control, program and record data from repeated test conditions. Mainly the laboratory tests concern the inertial components. The evaluation of inertial quality gyroscopes and accelerometers is the function of the Laboratory Test Division of CIGTF.

The major test equipment to evaluate a gyroscope include nine single-axis servo/rate turntables for the testing of rate-integrating gyroscopes; two tables having two-axis servo test capabilities for the testing of "free-roter" type gyroscopes; and a two-axis gyrocompassing test fixture used primarily for gyrocompass tests. Also included is the required electronic and data recording equipment.

The standard accelerometer test equipment includes a Leitz optical indexing head, a Goerz automatic indexing stand, and two 100-inch centrifuges. The tests performed include a 12-point linearity test, stability, repeatability, threshold and resolution, as well as centrifuge.

Provided a system passes all these tests, the inertial instrument may be sent to the environmental facilities for pressure-altitude, temperature, humidity, vibration, acceleration, and shock tests. The end aim, of course, is to insure a quality product once it completes a test cycle.

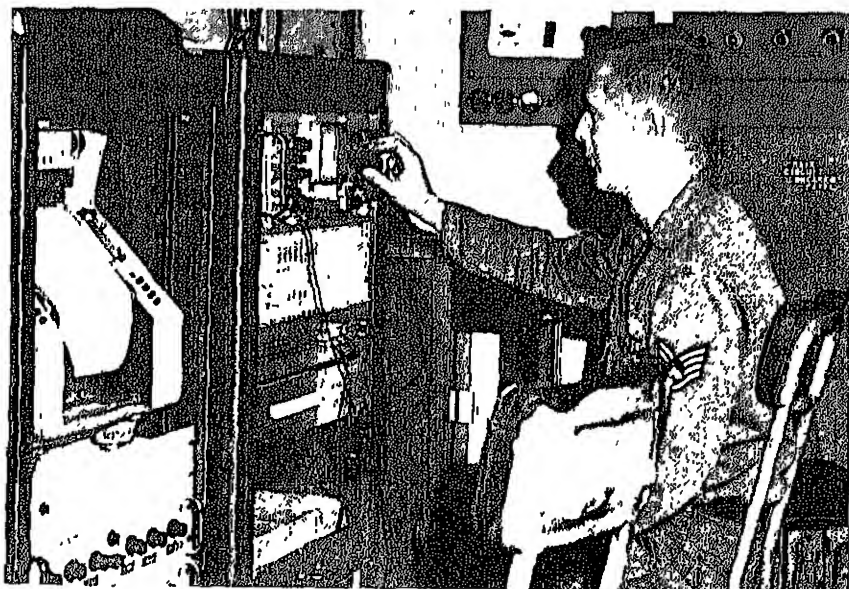
Track testing of guidance systems has long been in use at Holloman. The track could not be matched for producing abrupt changes and transient discontinuities in acceleration. The sled acceleration combined with a realistic (even though hard-to-control) vibration environment simulates the first few seconds of ballistic missile thrust. Therefore, the sled test environment is well suited for an overall shakedown of the complete guidance system (or components). The tests reveal any possible mismatched components, *e.g.*, the aerospace ground equipment and telemetry, as well as expose malfunctions in any of the parts of the inertial measurement unit.

The sled test program normally contains three distinct phases. First comes the preparatory phase to determine the proper environment. The system/component has different vibration specifications, and this phase insures that the track environment is tailored to match them. It is usually accomplished with dummy masses in place of the actual test item. The number of test runs in this phase depends upon many factors and ranges from one to six.

Phase two consists of five to eight test runs which provide a functional check of the system in the operational environment, *i.e.*, sled environment. This portion of the program either validates the system or reveals necessary design modifications.

The final phase usually takes from five to seven runs. It consists of a detailed quantitative analysis of system performance. Between each of the phases, prior to the first sled run as well as after each run, the system undergoes many other tests in the laboratory.

A unique method of testing inertial navigation systems is the use of a specially equipped portable van. Although van testing cannot replace sled or flight testing, it does



An Air Force technician of the Central Inertial Guidance Test Facility calibrates his recording equipment in the test van prior to a road test of the AC Electronics Advanced Manned Strategic Aircraft navigation system.

offer an inexpensive method of supplementing these types of tests. Surveyed check points are available at discrete intervals along the van route for use in evaluation of system accuracy as the van passes by, and for use as system position updates, if required. A transfer-alignment/maneuvering area is available at the Alkali Flat area southwest of Holloman. Using the bench marks as reference points, various routes are driven at different speeds to investigate the effect of variation of path-dependent parameters, such as profile, velocity, and g-level on the mechanization of techniques. Data acquired from this type of testing is used as a guide in specifying maneuvering required during flight.

The reason why CIGTF now conducts and highly recommends road testing, in a moving van, dates back to a simplified van test series consisting of five 30-minute runs conducted between July 23 and Aug. 3, 1965. The entire effort was accomplished with one engineer working about half-time and two technicians working full-time. The effort was directed primarily towards establishing hardware and operational requirements for using van testing as a complementary tool, to support guidance and control sled test programs. In addition to establishing hardware and operational requirements, sufficient information was obtained to assure that van testing of inertial navigation systems was not only feasible, but economical as well.

A test program using the van technique is one in support of Advanced Manned Strategic Aircraft (AMSA). It has extremely interesting and far-reaching implications. Technically an advanced development program, the results of Holloman testing will determine whether or not it attains full fledged weapon system status. Three contractors competed in van tests, designed to establish feasibility of alignment transfer schemes and position fix updating using Kalman statistical filtering techniques.

The first contractor to traverse the 134-mile, precisely surveyed desert route was Autonetics, using its N-16 as the Master Aircraft Navigator and its N-5 as the slave missile guidance system. The AKURON Velocity Matching Scheme (Kalman Filter), which is also pro-

grammed in the F-111 navigation system, was verified by the AMSA digital computer. Next to run the course was AC Electronics using an ASN-47/Carousel II combination. Finally, General Precision installed its gyro-monitor technique. Thus van testing has proven to be a very precise and relatively inexpensive way to check instrumentation and equipment operation, prior to the more costly flight tests which must compete for prime radar tracking time on the range.

Indicative of the information to be gained are:

- Ability or inability of the flight computer to update gyro bias terms for the proper latitude and longitude.
- System output position errors for long operating times.
- Total platform drift across a simulated mission of long duration.
- Resolution of operational and reliability problems prior to sled or flight test.
- Proof test of signal conditioning, instrumentation, and data handling equipment common to follow-on tests.
- Suitable data collection for checking out special ground computer software programs required for sled and aircraft data analysis.
- Means of transporting the system between track or flight line and laboratory without a system shutdown. This permits pre- and post-run calibrations to determine parameter shifts across a sled run without introducing transient effects due to shutdown.

It can be stated without reservation that the cost per van test is negligible compared to a sled or flight test.

The AMSA multiple source development approach ideally lent itself to van testing prior to C-141 tests. The goal was to demonstrate accurate transfer alignment (attitude transfer) and preflight techniques for rapid platform erection. Toward this end, the van test program was designed to:

- Determine functional integrity of contractor-provided equipments (Autonetics, AC Electronics and General Precision) and instrumentation in a relatively benign moving environment.
- Exercise each contractor's precision navigation and transfer alignment technique, and optimize these techniques based on system performance.

• Recommend systems which are qualified for follow-on flight testing, based on evaluation of the validity of techniques observed during road tests, i.e., based on observed performance and potential.

The van test program scope could not be defined in terms of a specific number of test runs. Instead, the pacing factor, in determining the end point of the test program, was the date upon which systems were to be available at Wright-Patterson AFB for integration into the C-141 for subsequent flight test. It should be stressed that qualification flight test was contingent upon having demonstrated, from the Air Force point of view, a satisfactory potential based on in-van performance.

In the air, there has been much advancement made in the testing of inertial navigation systems. Early tests consisted of single sortie, high altitude, closed loop check flights using prominent land marks, such as church steeples, TacAN stations and road intersections, as check points that characteristically, but erroneously, enhanced system performance. Today there are in being cooperative tracking radar nets at Fort Huachuca, Ariz., Edwards and Vandenberg Air Force Bases which enable unbroken coverage over the entire southwestern United States. Position accuracy data is derived by continuously comparing White Sands Missile Range FPS-16 radar tracking information (better than 100 foot accuracy) to outputs of the on-board inertial navigator being tested. All data is recorded on tape using the same IRIG-B time standard to enable comparative evaluation.

In all locations where tests on guidance and inertial systems are conducted—laboratory, test track, van, or in flight—overall test results determine system performance numbers and the reliability and maintainability of the system/components.

Customers, who bring in their products for testing, desire one of two services. Either they want their product validated, or they desire a program to be established to develop it. These two categories of test—validation and development—have a mandatory and an optional

phase. The Litton LN-15, evaluated for the U.S. Navy, typifies a validation program, and the MIT PACE, being evaluated for the Air Force Avionics Laboratory, typifies a development program.

Validation tests have mandatory test criteria to meet, and flights follow standardized, computer-designed flight paths in aircraft whose performance matches that of the inertial navigator's intended application. Pure (unaided) inertial, single-aided (Doppler-Inertial or Stellar-Inertial) inertial, and Stellar-Inertial-Doppler Navigation Systems are evaluated by standardized test programs. A good example of an optional test, requested by a customer, was the LN-15 Aircraft Carrier Insertion Mode feasibility demonstra-

tion. Another optional test in the near future will be position update of a Honeywell strap-down system in conjunction with the Navy Navigation Satellite System. Development tests follow a more leisurely pace and allow unrestricted contractor participation. The object is to uncover design deficiencies and to recommend engineering changes, prior to design freeze and production release.

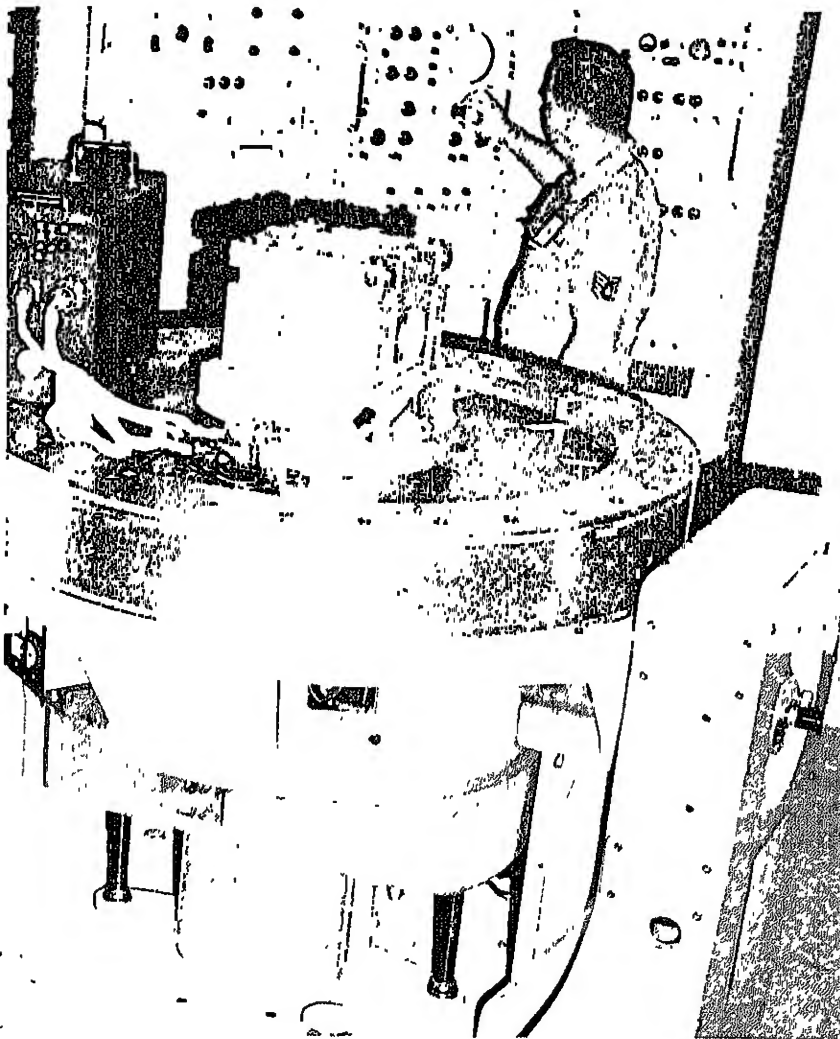
Testing of aircraft inertial navigation systems usually begins with CIGTF personnel observing system performance in the contractor's own plant. If it doesn't work there after a reasonable length of time, the system is refused. If system performance is satisfactorily demonstrated,

a delivery date is established. CIGTF engineers and technicians, along with training command and using command personnel, then spend 10 days to 2 weeks at the contractor's facility learning how the system operates, and how it must be handled and maintained. Meanwhile, back at Holloman, appropriate test bed aircraft are being readied for the installation. The CIGTF inventory consists of two C-130s, three C-131s, two F-106s and two UH-1Bs. The C-5A transport system will be evaluated in a C-141, SRAM in a C-130, and AMSA in a C-141 and C-135. These latter aircraft will be provided by Wright-Patterson AFB and stay at Air Force Missile Development Center for the duration of navigation system testing.

Following is a typical test program, the Litton LN-15 Inertial Autonavibrator.

Arriving at the CIGTF on March 1, 1966, mounted in a "standard can" that was especially designed for easy installation in any test aircraft, it went through five eight-hour navigation runs on a Scorsby (ship's motion) table at a frequency of six cycles per minute and six degrees total amplitude swing. These runs were performed on separate days from cold start in an ambient laboratory environment. The system next progressed into the C-130 for static, preflight taxi and shakedown flight tests; afterwards 12 successful data flights were required, 8 flown on range and 4 cross-country to or from Edwards AFB. Finally, the system was installed in the F-106 for evaluation in its intended operational environment. Two shakedown and 15 successful data flights (on 5 different flight paths) were required to complete this phase. Reaction time and ambient temperatures were recorded on all flights, as well as the complete history of failures, time to failure, time to repair, etc. A design deficiency brought to light during acrobatic maneuvers was subsequently corrected by the contractor and validated by the CIGTF, which accounted for the official test completion date of Dec. 9, 1966.

It should also be pointed out that the Optional Test Phase II-B, requested by Naval Air Development Center, Johnsville, (Insertion Mode), was identical to the C-130 Mandatory Phase II-A tests, except that the system was operated using an inser-



A Norden Gyroscope is strapped-down to a gyro test table for the NASA Advanced Centaur application. The mounting bracket, locally machined to 50 micro-inch tolerance out of a solid magnesium block, has two arc-second orthogonality.

tion technique, which simulated a remote system alignment prior to installation in the aircraft. Five data flights were flown on three different flight paths.

An excellent example of a test program that cuts across the entire spectrum of CIGTF capability is the Honeywell SIGN I system (H-408 strapped-down inertial sensor block). In March 1966, the Systems Engineering Group at Wright-Patterson AFB requested the evaluation in connection with its Low-Cost Compatible Midcourse Guidance Program. An extensive evaluation, consisting of laboratory tests and a series of rocket sled tests, was completed. From April through December 1966, the test item was subjected to a total of 11 sled tests. In addition to these tests in the simulated missile environment, numerous pre- and post-sled calibrations were performed in the Gyroscope and Accelerometer Test Laboratories. Both component and system analysts contributed to writing the test plan and reducing the test data.

An unusual event occurred on the 12th sled run. At first motion (FM) plus 9.5 seconds the rocket engine lost its rear slipper beam structure, causing large linear and angular vibrations. The rocket engine motion about the track caused the engine to lose its water brake scoop before reaching the masonite water dams. The sled received almost no braking going over the water dams and went off the north end of the 7-mile track at FM +60.3 seconds at an approximate velocity of 120 miles per hour. A review of the data revealed that the test item had continued to operate after sled impact and until the normal post-run power shutdown. A subsequent thorough laboratory inspection and checkout revealed that the SIGN system and power supply operated properly and displayed no immediate operational problems due to impact, save for a few dents, scrapes and bent connectors. Thus the customer received three tests—sled, flight and impact—all for the price of one.

In the non-inertial area, a comparative evaluation of terminal guidance contrast seekers and logic cir-

cuitry is progressing in a specially instrumented C-130 aircraft with two television cameras in the nose. Under the aegis of Aeronautical Systems Division, validation testing, in accordance with the directive of the Director of Defense Research and Engineering, commences several times during the year. Every balloon package sent aloft from Holloman first attains its flight altitude in the CIGTF Stratosphere Chamber. The first Apollo astronaut will sit in a seat and wear a suit that was certified in the CIGTF Environmental Laboratory. Ground was broken on August 31 for a \$371,000, 6,200-square-foot addition to the Environmental Laboratory which houses all of the CIGTF vibration equipment. In addition to the linear and angular machinery, 3-axis flight simulator, and 50-foot section of test track, the new building has a 60-foot tower in which zero-gravity drop testing can be performed. This new facility was ready for occupancy in March 1968.

Several one-of-kind items of major facility test equipment exist at Holloman. One is a multi-million dollar 260-inch radius precision centrifuge, designed to test components in a 100-gravity re-entry environment. Another is the stellar-simulator complex that duplicates 90 percent of all the sky's natural environment in a controlled environment area.

Looking to the future, CIGTF workload trends continue to show an exponential increase of equally important and challenging tasks, such as the Navy/Lockheed/Kearfott P3C system, the Air Force Avionics Laboratory LOCATING (Low-Cost of Ownership) system, the Army Advanced Aerial Fire Support System, Boeing 747/AC Electronics Carousel IV system, and the Navy Navigation Satellite system. Since the trend for commercial applications is to use techniques and equipment developed and proven in military systems, the testing of commercial systems, e.g., the AC Electronics Carousel System for the Boeing 747, is expected to play an increasingly important role.

If one had to boil down the CIGTF mission statement to a few, well-chosen words, they might be, "an unbiased, blue-suit test facility dedicated to insuring that the United guidance dollar expended "

Small Business Develops Navy Jungle Rescue Device

The Naval Air Systems Command has adopted a new jungle rescue system that will protect a downed aviator from injury, while being hoisted aboard a hovering helicopter.

The new jungle penetrator is a compact, bullet-shaped device which has a "pop-out" umbrella and two seats for dual rescue. The umbrella acts as a shield to ward off heavy jungle foliage on the way up to the rescue helicopter. The two seats will enable a helicopter crewman to descend and pick up an immobilized airman.

Development of the new system, performed by the Billy Pugh Co. of Corpus Christi, Tex., came in response to requirements announced by the Naval Air Systems Command.

The system presented by the Pugh Co. was evaluated by the Navy during tests at Lakehurst, N.J., and Warner Springs, Calif. Following stateside tests, combat-experienced helicopter crews conducted tests at the Naval Air Station, Cubi Point, Republic of the Philippines.

Equal Opportunity

(Continued from Page 15)

- Make it clear in the company's Equal Employment Opportunity policy statement that concrete steps will be taken to eliminate religious discrimination. Local managers should be asked to broaden the base of recruitment.

- Clearly assign and explain the responsibility for implementing the policy, and require periodic evaluations and reports.

A lack of equal management opportunity for reason of religion does not create the same threat to the stability of our social structure as does, for example, color prejudice. But it is not the degree of threat which should lead us to right wrongs; it is the existence of the wrong itself. It is a basic tenet of American democracy that no individual should be limited in the use of his talents except by his own ability and his own integrity. Industry needs a free market in talent for productivity. America needs it for fairness.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Ralph Earle II has been selected as Principal Dep. Asst. Secretary of Defense (International Security Affairs). He succeeds Townsend Hoopes, now the Under Secretary of the Air Force.

Capt. Hugh D. Murphree, USN, has assumed duties as Chief, Defense Communications Agency Operations Center/National Communications Systems Operations Center, in Arlington, Va. He succeeds Capt. James W. Short, USN.

DEPARTMENT OF THE ARMY

Robert E. Jordan III has been selected as General Counsel of the Army. He will also serve concurrently as Special Assistant to the Secretary of the Army for Civil Functions. Mr. Jordan has been serving as Acting General Counsel since September 1967, when he succeeded Alfred B. Fitt, who was named last year as Asst. Secretary of Defense (Manpower & Reserve Affairs).

Brig. Gen. Chester H. Johnson is the new Dep. Commander of the U.S. Army Weapons Command, Rock Island Arsenal, Rock Island, Ill.

Project management for Army Material Command Surveillance and Target Acquisition Aircraft Systems (STAAS) has been assigned to Col. Earl J. Cobey, who succeeds Brig. Gen. Lloyd L. Leech Jr. in the position.

Col. Dana S. Prescott has been assigned to head the Project Management Office for the Army Area Communications System (AACOMS), at Fort Monmouth, N.J.

Col. Robert A. Smith is the new chief of the Technical and Industrial Liaison Office, Office of the Chief of Research and Development.

DEPARTMENT OF THE NAVY

Maj. Gen. Louis Metzger, USMC has assumed duty at Marine Corps Headquarters as Dep. Chief of Staff (Research, Development and Studies).

RAdm. David B. Bell, now serving as Asst. Dep. Chief of Naval Operations (Manpower) has been selected as Dep. Commandant, National War College, Washington, D.C.

Capt. Rowland G. Freeman III has been assigned duty as Dep. Chief of Naval Material (Procurement & Production).

Dr. Thomas S. Amlie has been appointed Technical Dir. for the Naval Weapons Center, China Lake, Calif.

DEPARTMENT OF THE AIR FORCE

The following assignments have been made at USAF headquarters: Brig. Gen. Henry B. Kucheman Jr., Dep. Dir. of Development, Office of Chief of Staff (Research & Development), Col. Franklin B. Bevard, Dep. Dir. of Maintenance Engineering, Dep. Chief of Staff (Systems & Logistics); Col. Jerome J. Jones, Chief Electronic Warfare Div., Asst. for Reconnaissance, Dep. Chief of Staff (Research & Development); and Col. Robert F. Trimble, Asst. for Procurement Management, Asst. Secretary of the Air Force (Installations & Logistics).

The following assignments have been made at Air Force Systems Command: Col. Lionel C. Allard Jr., Program Director, Air Defense Control Warning System Program Office, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. Gordon E. Burrell, Dep. Dir. of Development, Air Force Satellite Control Facility, Los Angeles, Calif.; Col. Thomas J. Cecil, Dep. Dir., Systems Test, Air Force Flight Test Center, Edwards AFB, Calif.; Col. Vaughn E. Denning, Dir., Gemini B Titan III, Space & Missile Systems Organization (SAMSO), Los Angeles, Calif.; Col. James C. Fitzpatrick Jr., Chief, Atlas/Athena, SAMSO, Los Angeles, Calif.; Col. Henry C. Howard, Chief, Planning Div., Directorate of Ranges & Space Support, Dep. Chief of Staff (Operations), AFC Hq; Col. Robert J. Kuehn, Dep. for Communications

Systems, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. Henry J. Mazur, Systems Program Dir., Space Defense/Command System Program Office, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. James W. Rawers, Chief, Minuteman II Integration, Engineering Div., Deputy for Minuteman, SAMSO, Los Angeles, Calif.; Col. Herbert Waldman, Dir., Data Automation, AFSC Hq; Col. James S. Carson, Chief, Aircraft Missile Test Div., Air Force Proving Ground Center, Eglin AFB, Fla.; Col. John L. Gornall, Chief, Munitions Test Div., Air Force Proving Ground Center, Eglin AFB, Fla.; Col. Francis J. Henggeler, Chief, Procurement Div., Rome Air Development Center, Griffiss AFB, N.Y.; Col. George H. Sylvester, Chief, Electronics Test Div., Air Force Proving Ground Center, Eglin AFB, Fla.; Col. Thomas O. Lawton Jr., Asst. Dir., Range Support, Air Force Test Range, Patrick AFB, Fla.; Col. Roger H. Lengnick, Systems Program Director 949, SAMSO, Los Angeles, Calif.; and Col. Robert M. White, FX Advance Tactical Fighter Programs Officer, Aerospace System Div.

NOTICE

An item on page 17 of the April issue of the *Defense Industry Bulletin* announced the publication of a new Thesaurus of Engineering and Scientific Terms (TEST) and its availability to registered organizations from the Defense Documentation Center (DDC).

DDC has advised that unforeseen printing difficulties has delayed production of the thesaurus and, therefore, requests being received cannot be filled at the present time. The *Bulletin* will carry an item on the thesaurus when it becomes available.

Contractor Performance Evaluation A Progress Report

Brigadier General Walter J. Woolwine, USA

A little over four years ago, a new technique was introduced in the field of defense contracting. Despite some initial reservations on the part of industry and, for that matter, a few in Government, the Contractor Performance Evaluation (CPE) Program is being extended gradually to incorporate areas previously exempted from this new evaluation procedure.

In the Army Materiel Command (AMC), CPE is regarded as a significant management tool both for Government and the industrial contractors who carry out our annual billion dollar research and development program. In FY 1968, there are more than 100 contracts in the Army's CPE program, more than our overall total for the previous four fiscal years of the program's existence. Also, for the first time, managers of projects previously exempt from CPE are voluntarily requesting coverage, a further indication of CPE's value to AMC's management effort. The other Services have experienced similar interest and growth.

For a number of years, a feeling had been growing in the Military Services that some means of evaluating and producing a reliable record of the performance of contractors was a necessary adjunct to the source selection process. David Bell, former Director of the Budget, emphasized this need in his April 1962 recommendations to the President on the subject of government contracting for research and development. The Bell Report reviewed the government's experience since World War II in contracting with private institutions and enterprises for research and development work, and concluded that something must be done to improve the government's ability to supervise

and to evaluate the conduct of research and development efforts. In short, there was an urgent need to know whether the Government was getting a good product for which its money was expended, whether research and development work was being competently managed, and how to select the more competent from the less competent among research and development establishments. It was necessary to have the means to determine the credibility of competitive contractors' proposals.

There was pretty general agreement throughout the defense establishment on the need for evaluating the performance of contractors, and

for a standardized approach by all the Services which could yield data readily available to all.

The job of coming up with a program was handed to a working group composed of representatives from all the Military Services and the National Aeronautics and Space Administration (NASA). Their effort was not a hasty one. The initial evaluation system evolved was extensively tested in the field. Comments on the details of the program were obtained from the Military Departments and from the 21-man Defense Industry Advisory Council. From this, the CPE Program slowly emerged.

Today, CPE is applicable to research and development contracts of \$2 million or more for a single year or totalling \$10 million or more, and to follow-on production of \$5 million or more annually or totalling \$20 million. At present application is mandatory only for those research and development contracts which involve work in the program categories of advanced development, engineering development and operational system development, and for follow-on production contracts before firm specifications are available.

Built around a few simple printed forms, the evaluation report breaks down into four parts:

- Technical promises against achievements.
- Schedule promises against achievements.
- Cost target against actual cost.
- Narrative appraisal.

Evaluations are made periodically during a contract's life and at its conclusion. There is no effort to rate a contractor numerically, nor is there any associated "black list." The goal is to identify the contractual requirements and to objectively eval-



Brig. Gen. Walter J. Woolwine, USA, is the Director of Procurement and Production for the U.S. Army Materiel Command. A graduate of the U.S. Military Academy at West Point, Gen. Woolwine has a master's degree in business administration from Harvard University. He is also a graduate of the Industrial College of the Armed Forces.

uate the contractor's effort to meet them—then let the facts speak for themselves.

In actual practice, the CPE procedure is initiated by the project manager. He performs a first level performance evaluation, based on his intimate knowledge of the contractor's effort. This report is sent to the Contractor Performance Evaluation Group (CPEG) at AMC headquarters. The CPEG will either review the report for adequacy and conformance to policy and forward it to the contractor for comment, or the CPEG may, if there are questionable areas, perform an independent field evaluation. On all terminal reports, an independent evaluation by the CPEG is a requirement.

An important fact is that throughout the evaluation process there is opportunity for give and take between the project manager, the CPEG and the contractor, and their views and points of agreement or disagreement all become a part of the written records. Since the contractor sees and is given the opportunity to comment on how the project manager judges his performance, there is little likelihood of unsubstantiated statements finding their way into the evaluation report. It is noteworthy that the contractor's comments are usually made by a key official of the company, sometimes even the president. Again, the effort is to be objective, meaningful and factual—then let the facts speak for themselves.

Upon completion of the evaluation process, reports are sent to the Office of the Assistant Secretary of Defense (Installations and Logistics). Eventually, and most important, they go to the central data bank at the Defense Documentation Center, Alexandria, Va., where they are available for use by source selection agencies of all of the Services and NASA on a need-to-know basis. In fact, use of the data by source selection advisory councils is now mandatory. Others acting in a similar capacity for development or production contracts in excess of \$1 million are also required to use this data.

There have been some who have apparently concluded that there has been a waning interest in the program by management, largely due to the evidence of slight use of the

data by source selection boards. Actually, the trend is in the other direction. Planners did not originally contemplate widespread use of the data by source selection boards prior to 1968. It takes time for a contract to run its course and for the evaluation to find its way into the data bank, thus the data buildup has, of necessity, been slow. However, the problem is resolving itself as the number of contracts scheduled for evaluation continues to increase. A further indicator of the expanding interest in contractor performance evaluation is the recent response to a survey of CPE training needs. Almost 1,200 field personnel indicated a desire to attend a one-day training session on the program.

The present content of the data bank on these major development contracts is over 700 reports covering over \$20 billion of Army, Navy, Air Force and NASA contracts. The number of requests to the data bank in FY 1967 alone totalled 656. All these figures are expanding almost daily.

From the originally intended single purpose of providing data for future source selection, the CPE system is now widely used by project managers for managing their projects. It forces them to do a better job of specifying requirements and pinpointing milestones and, coincidentally, is a valuable source of lessons learned—especially in contract writing.

The contractor benefits as well and, in a manner of speaking, is protected from a too optimistic appraisal of his own capabilities. CPE also is effective in bringing current problems to the attention of company top management. Also, contractors are, quite naturally, sensitive about the "image" being recorded concerning their performance. A number of contractors, who in the past have wanted flexibility in the way of contractual work statements, now are insisting upon more definitive ones with readily measurable contractual milestones. The great potential for this program appears to be quite obvious to industry. It has been noted that a number of large companies have adopted a similar system for evaluating their in-house performance and that of their subcontractors. A look at the record is surely useful in deciding who should get future business.

The real value of the program is directly related to the size of the data bank. While it is growing

relatively rapidly, it is still far from achieving its practical potential. To correct this situation, there are a number of actions being taken. The Armed Services Procurement Regulation now also provides for the evaluation of architect-engineer contracts, construction contracts, and supply contracts. The coverage of the supply contracts (\$100,000 or more) was just added recently as a DOD-wide program after a pilot test phase by the Defense Contract Administration Services of the Defense Supply Agency. The inclusion of these contracts adds substantially to the coverage of the CPE program.

The Air Force has had for approximately 10 years its 189 system which evaluates small research and development contracts by a simple form, executed by the purchasing and contracting officer or the administrative contracting officer and the technical people. It is coded and mechanized to provide, on request, a tabular print-out of all contracts on file for each contractor. The main differences between this system and the DOD CPE Program are the dollar thresholds of \$25,000 versus \$2 million, the fact that it is only applied upon completion of the contract, and that it is not shown to the contractor except on his request.

The Army thinks so highly of this program that the Missile Command, AMC's largest research and development contracting agency, has requested and received from Air Force a copy of the complete file and updating, and refers to it on a continuing basis. The Army Electronics Command at Fort Monmouth has recently established a system patterned after the Air Force program. This system is about to be made DOD-wide with a threshold of \$100,000 and an option in the Military Departments to go below the DOD threshold. This program will be automated, providing a quick, simple readout in the form of a profile of a contractor's record of performance.

The next big step, to which DOD is now giving active attention, is to go beyond the recording of technical, schedule, and cost performance by individual contracts, in order to reflect the complete, current picture of a contractor's capability and the

(Continued on Page 27)



MEETINGS AND SYMPOSIA

MAY

Fifth National Colloquium on Information Retrieval, May 3-4, at the University of Pennsylvania, Philadelphia, Pa. Sponsors: Moore School of Electric Engineering, the University of Pennsylvania, Institute of Electrical and Electronic Engineers, Special Interest Group on Information Retrieval, American Documentation Institute Association for Computing Machinery and Frankford Arsenal. Contact: George Schecter, Chief, Objectives Analysis Office, Frankford Arsenal, Philadelphia, Pa. 19137, Phone (215) JE 5-2900, Ext. 3219.

Fourth Naval Material Command Systems Performance Effectiveness Conference, "Enhancing the Effectiveness of Fleet Systems—A Problem of Teamwork," May 8-9, at the State Department's West Auditorium, Washington, D.C. Sponsor: Naval Material Command. Contact: Mr. G. W. Neumann, Executive Secretary, SPE Steering Committee, Naval Ship Systems Command, Code 03511, Washington, D.C. 20360. Phone (202) OX 6-3097.

Universal Aspects of Atmospheric Electricity Conference, May 12-18, in Tokyo, Japan. Sponsors: Air Force Cambridge Research Laboratories, Office of Naval Research and the National Science Foundation. Contact: Capt. J. H. Shock (CRTE), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3636.

Silicon Carbide Second International Meeting, May 14-16, at Pennsylvania State University, University Park, Pa. Sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and the Carborundum Co. Contact: Mr. C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 2234.

1968 International Quantum Electronics Conference, May 14-17, at the Everglades Hotel, Miami, Fla. Sponsor: Office of Aerospace Research. Contact: Lt. Col. Robert Kalisch, Air Force Office of Scientific Research,

1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5518.

Aerodynamic Noise Symposium, May 20-21, at Toronto, Canada. Sponsor: Office of Aerospace Research. Contact: Major D. L. Calvert, Air Force Office of Scientific Research (SREM), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5568.

Functional Analysis Conference, May 20-24, at the University of Chicago. Sponsor: Office of Aerospace Research. Contact: Dr. R. G. Pohrer, Air Force Office of Scientific Research (SRMM), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5264.

JUNE

Electromagnetic Windows Symposium, June 5-7, at Atlanta, Ga. Cosponsors: Air Force Avionics Laboratory and Georgia Institute of Technology. Contact: Mr. Ireland (AVWE), Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55720.

Society of Photographic Scientists and Engineers Annual Conference, June 10-14, at Boston, Mass. Cosponsors: Rome Air Development Center and the Society of Photographic Scientists and Engineers. Contact: Mr. Pohorence (EMIRC), Rome Air Development Center, Griffiss AFB, N.Y. 13440, Phone (503) 830-7210.

Atomic Physics Conference, June 12-15, at New York University. Sponsors: Army Research Office—Durham, AEC, National Science Foundation, Air Force Office of Scientific Research, Office of Naval Research, New York University, Brookhaven National Laboratory and the International Union of Pure and Applied Physics. Contact: Robert Mace, Director, Physics Div., Army Research Office—Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285.

Multivariate Analysis Symposium, June 17-22, at Dayton, Ohio. Cosponsors: Aerospace Research Lab-

oratories and Wright State University. Contact: Dr. P. R. Krishnaiah (ARM), Aerospace Research Laboratories, Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3761.

Bioastronautics and the Exploration of Space Fourth International Symposium, June 23-27, at San Antonio, Tex. Sponsor: Aerospace Medical Div., (AFSC). Contact: Dr. Mitchell (AMRS), Aerospace Medical Div., (AFSC), Brooks AFB, Tex. 78235, Phone (512) LE 2-8811, Ext. 3211.

JULY

High Temperature Chemistry Conference, (dates undetermined), in Crystal Springs, Wash. Sponsor: Office of Aerospace Research. Contact: Dr. Donald L. Ball, Air Force Office of Scientific Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5337.

Fourth Annual Marine Technology Society Conference & Exhibit, July 8-10, in Washington, D.C. Sponsor: Marine Technology Society. Contact: Ted Evans, Conference Management Organization, Inc., Sheraton Park Hotel, 2660 Connecticut Ave., N.W., Washington, D.C. 20008.

Crystal Growth Conference, July 15-19, at the University of Birmingham, England. Sponsors: Air Force Cambridge Research Laboratories, U. K. Ministry of Technology, International Committee on Crystal Growth and the International Union of Pure and Applied Physics. Contact: Charles S. Sahagian (CRWB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3298.

Aurora and Airglow Conference, July 29-Aug. 9, at the Agricultural College of Norway, As, Norway. Sponsors: Office of Aerospace Research, Office of Naval Research, Defense Atomic Support Agency and the Air Force Cambridge Research Laboratories. Contact: Mr. K. W. Champion, Air Force Cambridge Research Laboratories (CRUB), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3033.



FROM THE SPEAKERS ROSTRUM

Excerpt from address by Adm. Thomas H. Moorer, USN, Chief of Naval Operations, at the American Ordnance Assn. Luncheon, Ft. McVie, Washington, D. C., Feb. 19, 68.

THE CALIBER OF U. S. SEAPOWER

* * *

One of the determining factors in sizing the precise size, number, and caliber of U.S. forces and weapons is necessarily the capability of any potential adversary. With this in mind I would like to give you some of our "competitor's" or "challenger's" viewpoints on naval power and its relation to their country's defense posture. I refer, of course, to the Soviet Union's Navy which is second only to ours in size and firepower.

You might be surprised to find that any of the Soviet views of seapower may be a reflection of our own. As an ordnance people, I think you would be particularly interested in some recent statements by Fleet Admiral Gorshkov, the Chief of the Soviet Navy. He made these remarks on the eve of the 1968 Soviet Navy as they prepared to celebrate the 50th anniversary of the Soviet Armed Forces. Admiral Gorshkov proudly stated, at the 1968 Soviet Navy has changed completely . . . with additions of new classes of ships, with increased speed and almost unlimited range; armed with ballistic, winged, anti-aircraft and anti-submarine rockets. The Soviet Chief went on to say that their ships have long-range homing torpedoes and new types of traditional weapons with increased muzzle velocities, greater ranges and better accuracy . . . as well as new rocket propelled aircraft, anti-submarine aircraft and helicopters that can unpredictably hit surface ships and submarines.

Summing up the role of the Soviet Navy, Gorshkov stated that, because

of increased capability, the Soviet Navy now has a greater role in the general system of the armed forces and warns that we can expect in the future to see a greater number of Soviet ships in the Atlantic, Pacific and Indian Ocean areas.

It is also interesting to note that the senior Soviet naval officer acknowledges a manpower problem coupled with their growing advances in science and technology. This statement agrees with one of our basic principles and areas of concern. He states that the fleet must get good men with good general and technical educations, and that Navy preinductees must prepare for the critical specialties needed. In short, men are still the heart of any weapon system.

I think the message rings out loud and clear on the forward technical movement of the Soviet naval arsenal. These material increases and improvements in Soviet naval capabilities are tangible evidence which we can measure. We can only assume that the technical growth of the Soviet Navy reflects the Soviet strategy and, thereby, gives us some indication of their political aims.

The caliber of U.S. seapower must be gauged to meet and defeat any potential seapower. As you know this task is a continuing one and, because

of the change that is always with us, we must avoid the danger of becoming embalmed in a single weapon or a single weapon system—and I use the word embalmed advisedly—if we are to maintain the necessary power and flexibility of our naval forces.

How do we meet these challenges? The challenges presented by brush fire wars in foreign lands, the challenges which we see ahead of us on the seas and ocean areas of the world, the resultant challenges in the weapons field.

First, because our weapon systems are necessarily sophisticated, it follows, unfortunately, that they are expensive. It further follows that because of this expense, they must be designed for long life yet amenable to improvement and refinement. Reduced to its simplest terms, you and I must concern ourselves with obtaining and operating the required level of firepower at the lowest possible cost. This is certainly evident when we consider that the Defense Department is spending over \$70 billion this year. The only answer is more efficient, economical management of all our resources—the effective management of change if you will. Although the Navy has many programs under way toward that end, it is not solely a military responsibility. Industry must accept its commensurate share.

With the press of our many commitments, money is not as readily available today as it has been sometimes in the past. In order to fund a new and promising idea or concept to fruition, we are oftentimes faced with the alternative of taking funds from one worthwhile project and applying them to another. We can no longer have three or four parallel development efforts. This imposes a requirement for better management analysis, and technological application to insure a sound design at an early stage in the development cycle of a weapons system or component. So much for the first challenge in the weapons field, which is basically meeting the problem of expense.

The second challenge is, as you would suspect, quality. The produc-



Adm. Thomas H. Moorer, USN

tion of higher quality weapons and components by industry is mandatory, if the Navy is to maintain supremacy in its seaborne and airborne environment. As an example, solid state devices have been a boon to our modern torpedo technology. Industry has once again demonstrated that complex and sophisticated torpedoes can be produced in quantity for our anti-submarine warfare forces. Producing a large quantity of weapons such as this to meet high quality specifications is not always easy. In fact, we find in some cases a real reluctance on the part of the manufacturers to tighten manufacturing procedures solely to meet critical specifications for military application. We can, of course, understand the reasons for such reluctance; however, it is a problem that we must solve together.

Similar examples exist in other areas where technical requirements demand that equipment be designed to meet higher specifications, and more stringent operational characteristics. This is a continuing major problem which requires our joint analysis and solution.

Our third and perhaps greatest challenge is the problem related to the difficulties encountered by on-station personnel, as well trained as they are, to keep the weapons "ready to fire."

The availability of the complete system is, as you know, critically dependent upon each component. Each component must be extremely reliable, backed up by a well-trained technician, a well-stocked repair parts locker, and a responsive pipeline. It is extremely easy to describe how to "maintain" a weapon, but extremely complex and difficult to accomplish. We must give more consideration to the man in our systems. We must provide designs which will insure the ability of each human and mechanical component to function smoothly and, thereby, give us a "ready" system.

These are some of the challenges in the weapons field which are evident in our operations today.

Looking to our future, we hope to see built into Navy ships some new types of weapons. We need:

- Lightweight guns and their solid state, digital, computerized fire control systems.

- New anti-air warfare missiles—a surface-to-surface missile, advanced

point defense missile, advanced surface-to-air missile, Sea Sparrow, and advanced variations of missiles presently in our locker—Talos being a current example.

- Rocket-assisted projectiles, and high-velocity sabot projectiles with greatly increased ranges, and with mil accuracies of the order of current naval guns. These are now in test and evaluation, and show great promise.

- We need new anti-submarine warfare torpedoes—the Mark 48 (submarine launched) and the Mark 46 (ship and aircraft launched).

- We need new mines of greater versatility, reliability and effectiveness.

All of these needs are representative of complete weapon systems and munitions needed to insure that necessary firepower is available whenever needed to reinforce our tactics and strategies.

In addition to these complete systems, we need to increase our quality and reliability with some new components. Specifically, some examples of areas where particular improvement will pay off large dividends are:

- Some new lightweight body armor for personnel—cockpit and boat crewman protection is vital.

- An unsinkable, light draft, armored small boat with plenty of firepower which is less vulnerable to mines and mortars. In short, we need an efficient unsinkable, self-propelled "log," with guns.

- An automatic recoilless rifle with self-combustible ammunition to increase our available firepower.

There are many other areas in addition to these few I mentioned, where diligent scientific and technical efforts are needed and would be of great assistance to our men in uniform who count on us for the proper tools to survive and win.

I have tried to leave you with three thoughts today. One, that our past record as evidenced in our current operations in Vietnam is outstanding. Two, that the sudden changing attitude and capability of the Soviets to deploy its naval forces clearly emphasizes the need for us to maintain a vigilance and new awareness of the value of a modern Navy, equipped with the best weapon systems that technology can devise and we can afford.

Thirdly, I sincerely believe we must

all make a greater, more concerted effort to produce new quality systems, on a reasonable time schedule, that will have the highest degree of reliability and maintainability for our sailors and marines, the users.

In your hands—in a very real sense—rests the future security of the United States and the Navy's future readiness. I am sure that you agree with me that this is not a challenge, or responsibility, which we can take lightly. In the vernacular of the sailors of the old ships of the line, "It's time to move up our big guns."

Navy Develops Multi-Purpose Rescue Ship

The U. S. Navy is developing a new multi-purpose submarine rescue ship (ASR) which will be capable of serving as a surface support ship for rescue submersibles, a submarine rescue ship equipped with the McCann diving chamber, a deep-sea diving support ship, and an operational control ship for salvage operations.

Construction of the new ships is scheduled to begin later this year with delivery to the Fleet in about two and a half years. Ten ships of the new class are now planned with the first two, ASR-21 and ASR-22, to be built by Alabama Drydock and Shipbuilding Co.

The new submarine rescue ships will replace the 10 ships now in service which were built during World War II to modified tug boat designs, and are now obsolete in view of the Navy's progress in development of new deep submersible rescue and salvage equipment.

ASRs of the new class will be manned by a crew of 6 officers and 109 men. The ships will be 251 feet long with a beam of 26 feet. For self-defense, the ship will be armed with two 8-inch/50-caliber dual purpose guns and four .50-caliber machine guns.

Overall design and construction of the ships and their deep sea rescue vehicle handling system is under the direction of the Naval Ship Systems Command. The rescue submersibles, deep-sea diving and salvage systems, and certain related equipment in the new ASRs are being developed by the Navy's Deep Submergence Systems Project with offices in Chevy Chase, Md.

Calendar of Events

May 5-9: Electrochemical Society Meeting, Statler-Hilton Hotel, Washington, D.C.

May 5-10: Society of Plastic Engineers Meeting, New York, N.Y.

May 6-7: Ninth Annual Symposium on Human Factors in Electronics, Institute of Electrical & Electronics Engineers, Marriott Twin Bridges Motor Hotel, Washington, D.C.

May 6-8: Aerospace Electronics Conference, Dayton, Ohio.

May 6-8: Twenty-second annual Technical Conference and Exhibit of the American Society for Quality Control, Sheraton-Park Hotel, Washington, D.C.

May 6-9: Third National Conference on Aerospace Meteorology, New Orleans, La.

May 7: Armed Forces Management Assn. Meeting, Fort McNair Officer's Club, Washington, D.C.

May 7-9: Thirteenth National Meeting of the Society of Aerospace Material and Process Engineers, Chicago, Ill.

May 8-9: American Helicopter Society Annual Forum, Sheraton-Park Hotel, Washington, D.C.

May 8-10: 1968 Electronic Components Conference, Washington, D.C.

May 9: American Ordnance Assn. Annual Meeting, Washington-Hilton Hotel, Washington, D.C.

May 9-11: American Institute of Industrial Engineers Meeting, Tampa, Fla.

May 9-12: Sixth International Air Fair, Biggin Hill, Kent, England.

May 12-15: Twenty-seventh Annual National Conference of the Society of Aeronautical Weight Engineers, Jung Hotel, New Orleans, La.

May 13-16: Thirteenth Annual Corporate Aircraft Safety Seminar, Sheraton-Chicago Hotel, Chicago, Ill.

May 14-16: Armed Forces Communications & Electronics Assn. Annual Convention, Sheraton Park Hotel, Washington, D.C.

May 14-17: 1968 International Quantum Electronics Conference, Everglades Hotel, Miami, Fla.

May 19-23: 1968 News Conference of the Aviation Space Writers Assn., Cocoa Beach, Fla.

May 20-22: International Microwave Symposium, Detroit, Mich.

May 21-24: First International Conference on Titanium, London, England.

May 21-26: International Exposition of Flight and General Aviation Conference, Las Vegas, Nev.

May 22-23: Navy-National Security Industrial Assn. ASW Innerspace Conference, Washington, D.C.

May 22-24: Aerospace Industries Assn. Annual Williamsburg Conference, Williamsburg, Va.

May 23-24: Third Aerospace Mechanisms Symposium, Pasadena, Calif.

June 3-5: Fourth International Air Cargo Forum, San Francisco, Calif.

June 3-6: Electronic Industries Assn. Annual Convention, Hotel Ambassador, Chicago, Ill.

June 4-6: Third Solid Propulsion Conference, Atlantic City, N.J.

June 9-14: Society of Photographic Scientists and Engineers Meeting, Sheraton-Boston Hotel, Boston, Mass.

June 10-12: Fourth International Air Cargo Forum, San Francisco, Calif.

June 10-14: Fourth Propulsion Joint Specialist Conference, Sheraton-Cleveland Hotel, Cleveland, Ohio.

June 12: National Security Industrial Assn. Undersea Warfare Center Briefing, Pasadena, Calif.

June 18-21: Army Science Conference, West Point, N.Y.

June 24-26: Third Thermophysics Conference, Los Angeles, Calif.

June 24-26: Fluid and Plasma Dynamics Conference, Ambassador Hotel, Los Angeles, Calif.

June 26-28: Joint Automatic Control Conference, University of Michigan, Ann Arbor, Mich.

June 26-28: National Security Industrial Assn. Meeting, U.S. Naval Submarine Base, New London, Conn.

June 27-30: Society of Nuclear Medicine Meeting, St. Louis, Mo.

July 8-9: Management in the Fields of Aerospace Meeting, Montreal, Canada.

July 8-10: Marine Technology Society Fourth Annual Conference & Exhibits, Sheraton Park Hotel, Washington, D.C.

July 15-18: Seventh Reliability and Maintainability Conference, Jack Tar Hotel, San Francisco, Calif.

Contractor Performance Evaluation

(Continued from Page 23)

likelihood that he will fulfill his commitments. The aim is to provide a reliable, up-to-date profile of each major contractor expecting to do business with the Government. DOD's managers, as well as procurement officers and source selection people, view this information as vital to their decisions on contractor selection and in determining profit or fee. With the data already available to accomplish this and with the means at hand for rapid recording and retrieval of data, this aim should be attained in the not too distant future.

Evidence from industry of the value of CPE is the fact that a number of companies have established formal CPE programs for subcontract evaluations, patterned closely after the DOD system of objective reporting. Their concepts are similar to the DOD concept: to provide a better means of discerning the contractor who is an effective and efficient performer from the one who is not. By adopting the CPE procedures in their organizations, contractors have indicated that it improves their visibility and organizational discipline in meeting their contractual commitments. CPE is reaching a stage of maturity where the program can realize its objectives as an effective technique for both the Government and industry.

CPE Guide Available

Additional information on the DOD Program of Contractor Performance Evaluation may be obtained from a guide issued by the Defense Department. It is titled, "Guide to Contractor Performance Evaluation (Development and Production)," dated June 1966. It includes administrative procedures governing the preparation, processing and use of Contractor Performance Evaluation Reports.

The guide is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, price 50¢.

Questions on the interpretation of this guide and special cases not covered in it should be referred to the Director of Contractor Performance Evaluation, Office of the Assistant Secretary of Defense (Installations and Logistics), The Pentagon, Washington, D.C. 20301.

STATUS OF FUNDS

DEPARTMENT OF DEFENSE Military Functions and Military Assistance Program Quarterly Report

Prepared by:

Directorate for Financial Analysis and Control
Office of the Assistant Secretary of Defense (Comptroller)
Room 3C 839, The Pentagon Phone: (202) OXford 7-2332

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Expenditures Second Quarter, Fiscal Year 1968 (Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Expenditures				Unpaid obligations	
	Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	At start of year	As of Dec. 31, 1967
Military Personnel						
Active forces	1,579,856	1,579,318	1,518,241	8,961,735	850,076	1,230,912
Reserve forces	63,813	62,746	66,782	498,957	149,863	105,415
Retired pay	168,153	169,646	175,045	1,010,429	7,622	6,775
Undistributed	-44,668	-16,707	41,829	79,673	-	-79,673
Total—Military Personnel	1,767,155	1,795,002	1,801,899	10,550,795	1,007,561	1,263,428
Operation and Maintenance	1,874,199	1,661,083	1,594,721	9,944,895	*3,542,486	3,886,928
Procurement						
Aircraft	765,863	754,704	792,766	4,752,950	*9,317,974	8,934,716
Missiles	207,020	167,268	142,433	1,024,050	1,929,015	1,976,246
Ships	119,989	142,728	191,445	805,834	3,049,781	2,914,424
Tracked combat vehicles	47,710	46,651	33,012	221,896	632,680	610,962
Ordnance, vehicles, and related equipment	444,635	515,546	284,221	2,801,283	6,721,730	7,275,084
Electronics and communications	131,398	93,269	116,142	666,948	1,998,176	1,921,144
Other procurement	244,658	177,450	170,311	1,004,212	1,947,502	2,002,177
Undistributed	52,377	-7,548	-26,814	380,996	-386,056	-779,028
Total—Procurement	2,004,649	1,890,066	1,703,517	11,658,169	25,210,802	24,856,723
Research, Development, Test, and Evaluation						
Military sciences	106,156	66,691	71,717	499,428	867,381	857,650
Aircraft	110,648	59,640	122,617	594,899	796,125	892,623
Missiles	236,139	217,340	203,553	1,296,363	1,095,907	1,395,932
Astronautics	99,416	94,594	111,244	623,174	649,793	538,700
Ships	24,784	23,701	14,603	156,966	212,773	215,746
Ordnance, vehicles, and related equipment	37,353	33,556	20,707	179,746	235,442	226,204
Other equipment	73,104	73,899	55,880	384,097	541,757	524,732
Program-wide management and support	40,707	29,773	43,787	231,470	163,038	165,791
Undistributed	-36,012	-3,206	-18,702	97,357	-194,032	-292,900
Total—Research, Development, Test, & Eval.	692,299	595,984	625,466	4,063,499	4,368,185	4,524,481
Military Construction	105,662	120,956	92,446	649,961	1,581,256	1,340,394
Family Housing	45,837	44,910	52,293	272,757	114,964	153,893
Civil Defense	6,468	7,316	11,066	50,275	91,893	77,998
Other—Special Foreign Currency Program	33	730	40	910	2,193	1,451
Revolving and Management Funds	-117,696	23,650	-96,547	152,907	527,834	362,071
Subtotal—Military Functions	6,378,606	6,139,698	5,784,901	37,343,669	36,447,172	36,466,366
Military Assistance	57,672	53,898	39,994	218,795	2,112,357	1,983,725
TOTAL—DEPARTMENT OF DEFENSE	6,436,279	6,193,596	5,824,895	37,562,464	38,559,529	38,450,091

* Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,300 thousand
NOTE: Detail may not add to rounded totals.

DEPARTMENT OF THE ARMY

	Expenditures				Unpaid obligations	
	Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	At start of year	As of Dec. 31, 1967
Military Personnel						
Active forces	644,881	600,532	601,570	3,527,841	392,872	647,904
Reserve forces	35,676	42,944	39,319	337,861	112,152	76,393
Undistributed	-42,106	82	31,056	59,879	—	-59,879
Total—Military Personnel	638,451	643,558	671,945	3,925,081	505,024	664,418
Operation and Maintenance	849,095	643,850	609,830	3,760,815	1,252,029	1,404,718
Procurement						
Aircraft	92,032	78,841	108,745	556,687	1,303,735	1,019,000
Missiles	29,174	32,227	33,891	162,232	458,264	556,854
Tracked combat vehicles	47,177	46,479	32,993	220,508	611,133	587,484
Ordnance, vehicles, and related equipment	200,333	174,631	100,219	1,172,822	3,387,912	3,620,072
Electronics and communications	55,927	27,330	67,087	241,164	780,554	795,141
Other procurement	86,642	64,843	65,661	344,966	817,300	796,925
Undistributed	27,176	-17,078	-1,155	353,495	-386,056	-748,712
Total—Procurement	538,462	407,271	407,442	3,051,874	6,972,842	6,626,764
Research, Development, Test, and Evaluation						
Military sciences	11,086	13,712	13,563	74,500	133,665	132,255
Aircraft	11,007	12,291	13,996	80,344	85,463	78,061
Missiles	50,914	50,620	61,445	329,691	435,876	504,822
Astronautics	1,481	1,147	1,488	10,078	15,069	9,050
Ordnance, vehicles, and related equipment	21,689	20,034	11,370	94,293	136,432	133,718
Other equipment	32,850	26,626	24,606	150,108	218,437	210,716
Program-wide management and support	6,442	4,949	7,677	41,271	39,835	46,505
Undistributed	-13,637	-17,095	-3,332	87,400	-194,032	-282,943
Total—Research, Development, Test, & Eval.	121,833	112,285	130,812	867,685	870,745	832,185
Military Construction	51,132	60,059	18,083	375,218	818,076	600,087
Revolving and Management Funds	-40,641	34,001	32,844	212,621	58,732	-54,688
TOTAL—DEPARTMENT OF THE ARMY	2,158,334	1,901,021	1,870,958	12,193,294	10,477,449	10,073,485

DEPARTMENT OF THE NAVY

	Expenditures				Unpaid obligations	
	Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	At start of year	As of Dec. 31, 1967
Military Personnel						
Active forces	483,085	524,763	408,378	2,645,895	232,405	279,393
Reserve forces	12,060	11,489	10,992	76,808	19,698	16,786
Undistributed	-7,469	-13,440	28,806	20,024	—	-20,024
Total—Military Personnel	487,676	522,812	448,176	2,742,727	252,103	276,155
Operation and Maintenance	442,393	439,433	419,321	2,700,787	*1,234,696	1,261,992
Procurement						
Aircraft	275,883	264,202	306,188	1,583,322	*3,505,672	2,913,138
Missiles	35,889	18,330	19,844	198,162	470,557	548,707
Ships	119,989	142,728	191,446	805,834	3,049,781	2,914,424
Tracked combat vehicles	533	172	19	1,388	21,547	23,478
Ordnance, vehicles, and related equipment	154,229	174,566	74,913	749,888	1,611,746	1,849,468
Electronics and communications	43,153	34,534	34,623	223,668	656,377	579,933
Other procurement	73,612	62,456	59,428	374,280	921,116	1,031,566
Undistributed	23,278	5,174	-14,522	22,692	—	-25,469
Total—Procurement	726,565	702,161	671,939	3,959,234	10,236,796	9,835,245
Research, Development, Test, and Evaluation						
Military sciences	36,838	14,165	9,107	109,456	127,323	112,025
Aircraft	23,644	18,908	47,398	164,772	260,838	193,316
Missiles	100,314	64,585	62,273	465,904	293,783	415,201
Astronautics	1,952	2,449	763	12,159	12,677	11,751
Ships	24,784	23,701	14,663	156,966	212,773	215,746
Ordnance, vehicles, and related equipment	15,664	13,522	9,337	85,453	99,010	92,486
Other equipment	11,333	6,225	6,439	57,433	89,328	94,741
Program-wide management and support	14,273	3,395	14,801	63,351	97,989	85,941
Undistributed	809	-1,292	1,379	8,416	—	-8,416
Total—Research, Development, Test, & Eval.	229,611	145,657	166,161	1,123,910	1,193,721	1,212,792
Military Construction	-13,737	11,091	37,159	2,622	269,300	392,910
Revolving and Management Funds	-93,404	-38,121	-87,410	-238,351	462,849	443,793
TOTAL—DEPARTMENT OF THE NAVY	1,779,105	1,783,031	1,655,347	10,290,929	13,649,465	13,422,886

* Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,800 thousand.

DEPARTMENT OF THE AIR FORCE

	Expenditures				Unpaid obligations	
	Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	At start of year	As of Dec. 31, 1967
Military Personnel						
Active forces	451,890	454,023	508,293	2,788,499	224,799	303,615
Reserve forces	16,077	8,313	16,471	84,288	18,013	12,236
Undistributed	4,907	-3,349	-18,033	-230	—	230
Total—Military Personnel	472,874	458,987	506,731	2,872,557	242,812	316,081
Operation and Maintenance	502,530	502,945	483,844	2,993,509	955,856	1,112,334
Procurement						
Aircraft	388,948	411,661	377,833	2,612,941	4,508,567	5,002,578
Missiles	141,957	116,711	88,698	663,656	1,000,194	870,681
Ordnance, vehicles & related equipment	89,977	166,125	108,841	877,033	1,719,842	1,803,727
Electronics and communications	31,942	31,017	13,886	198,573	555,915	541,925
Other procurement	81,198	47,854	41,044	270,686	164,740	130,814
Undistributed	2,173	4,211	-11,211	4,515	—	-4,553
Total—Procurement	736,194	777,581	619,089	4,627,403	7,949,258	8,344,673
Research, Development, Test, and Evaluation						
Military sciences	15,816	11,961	12,667	81,274	131,619	127,253
Aircraft	75,997	28,441	61,223	349,783	449,824	621,246
Missiles	84,911	102,135	79,835	500,768	366,248	475,909
Astronautics	95,983	90,998	108,993	600,937	622,047	517,899
Other equipment	28,921	41,048	24,835	176,556	233,992	219,275
Program-wide management and support	19,992	21,429	21,309	126,848	25,214	33,345
Undistributed	-23,184	15,181	-16,749	1,541	—	-1,541
Total—Research, Development, Test & Eval.	298,488	311,191	292,112	1,837,706	1,828,944	1,993,387
Military Construction	66,934	47,454	36,226	263,243	473,206	334,065
Revolving and Management Funds	12,250	12,611	-37,906	46,210	6,252	-27,832
TOTAL—DEPARTMENT OF THE AIR FORCE	2,089,219	2,110,770	1,900,095	12,640,627	11,456,328	12,072,708

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Expenditures				Unpaid obligations	
	Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	At start of year	As of Dec. 31, 1967
Military Personnel						
Retired pay	168,153	169,646	175,045	1,010,429	7,622	6,775
Operation and Maintenance	80,182	74,854	81,727	489,285	99,905	107,883
Procurement						
Ordnance, vehicles, and related equipment	96	224	248	1,540	2,230	1,817
Electronics and communications	376	388	546	3,543	5,330	4,145
Other procurement	3,206	2,297	4,178	14,280	44,346	43,372
Undistributed	-250	145	74	294	—	-294
Total—Procurement	3,428	3,053	5,047	19,658	51,906	49,040
Research, Development, Test, and Evaluation						
Military sciences	42,415	26,854	36,380	234,198	474,774	486,117
Military Construction	1,332	2,353	978	8,878	20,674	13,332
Family Housing	45,837	44,910	52,293	272,757	114,964	153,893
Other—Special Foreign Currency Program	33	730	40	910	2,193	1,451
Revolving and Management Funds	4,099	15,160	-4,075	132,428		797
TOTAL—DEFENSE AGENCIES/OSD	345,481	337,559	347,435	2,168,543	772,037	819,289

OFFICE OF CIVIL DEFENSE

Civil Defense	6,468	7,316	11,066	50,275	91,893	77,998
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	6,468	7,316	11,066	50,275	91,893	77,998

MILITARY ASSISTANCE

Military Personnel	56	56	18	162	525	384
Operation and Maintenance	28,974	12,998	30,660	122,235	289,568	285,827
Procurement						
Aircraft	7,457	6,054	7,301	37,750	235,101	210,202
Missiles	1,090	8	841	2,587	23,650	15,031
Ships	613	2,717	21	4,925	114,450	115,072
Ordnance, vehicles, and related equipment	14,499	1,191	15,886	48,103	264,633	237,676
Electronics and communications	5,298	1,694	1,467	20,667	132,402	118,493
Other procurement	4,693	2,431	4,216	17,934	127,226	123,765
Total—Procurement	33,650	14,095	29,730	131,964	897,462	820,238
Research, Development, Test, and Evaluation	—	—	97	-980	401	79
Military Construction	1,835	4,334	815	10,070	171,824	161,456
Revolving Fund	-2,715	12,463	-12,300	-35,302	764,607	313,781
Undistributed	-4,127	9,952	-9,026	-9,354	-12,030	401,960
TOTAL—MILITARY ASSISTANCE	57,672	53,898	39,994	218,795	2,112,357	1,983,725

Obligations

Second Quarter, Fiscal Year 1968
(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Dec. 31, 1967
		Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	
Military Personnel						
Active forces	18,995,405	1,542,390	1,558,312	1,680,066	9,479,848	9,515,552
Reserve forces	958,750	62,753	53,824	55,381	453,435	505,315
Retired pay	2,020,000	168,139	169,683	175,245	1,009,379	1,010,621
Total—Military Personnel	21,974,155	1,773,280	1,781,820	1,910,691	10,942,662	11,031,493
Operation and Maintenance	20,822,192	2,002,618	1,591,757	1,752,237	11,093,390	9,728,802
Procurement						
Aircraft	13,263,901	1,210,120	530,685	856,620	4,588,298	3,675,603
Missiles	3,254,091	223,769	182,486	254,301	1,140,668	2,113,423
Ships	4,884,230	107,612	178,716	96,764	709,429	4,174,801
Tracked combat vehicles	478,168	23,481	5,597	13,425	201,720	276,448
Ordnance, vehicles and related equipment	9,126,574	766,100	521,988	388,911	4,068,481	5,058,093
Electronics and communications	2,262,721	109,580	95,151	88,643	627,974	1,634,747
Other procurement	3,055,172	258,677	206,882	177,133	1,108,987	1,946,185
Undistributed	-43,022	—	—	—	—	-43,022
Total—Procurement	36,281,836	2,699,341	1,716,507	1,875,797	12,445,559	23,836,277
Research, Development, Test, & Evaluation						
Military sciences	1,187,049	86,906	80,612	122,925	515,489	671,560
Aircraft	1,485,273	115,810	130,583	44,533	719,083	766,190
Missiles	2,566,553	224,311	129,172	107,297	1,636,050	930,503
Astronautics	1,289,885	117,541	73,642	61,262	576,477	713,408
Ships	377,034	13,613	20,306	24,200	169,057	207,977
Ordnance, vehicles, and related equipment	387,618	21,687	14,069	23,454	177,348	210,270
Other equipment	935,518	56,078	51,326	53,292	376,922	558,596
Program-wide management and support	710,964	52,948	38,096	53,368	320,664	390,300
Emergency Fund	23,982	—	—	—	—	23,982
Undistributed	-242,269	—	—	—	—	-242,269
Total—Research, Development, Test, & Eval.	8,721,605	683,894	537,807	490,329	4,491,089	4,230,516
Military Construction	3,164,103	103,814	76,425	120,591	599,092	2,565,010
Family Housing	874,091	54,286	41,950	50,609	315,380	558,712
Civil Defense	108,603	7,387	4,825	10,759	37,127	71,476
Other—Special Foreign Currency Program	16,344	123	32	13	168	16,176
Subtotal—Military Functions	91,962,929	7,329,743	5,751,125	6,211,023	39,924,466	52,038,462
Military Assistance	394,883	5,672	4,110	-3,458	171,649	223,234
TOTAL—DEPARTMENT OF DEFENSE	92,357,812	7,335,416	5,755,234	6,207,566	40,096,116	52,261,696

DEPARTMENT OF THE ARMY

	Available for obligation	Obligations				Unobligated balance Dec. 31, 1967
		Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	
Military Personnel						
Active forces	7,874,405	612,889	630,489	686,211	3,853,193	4,021,212
Reserve forces	644,100	42,173	34,094	32,473	300,496	343,604
Total—Military Personnel	8,518,505	655,062	664,583	718,683	4,153,688	4,364,817
Operation and Maintenance	8,068,008	805,145	563,433	725,278	4,238,939	3,829,069
Procurement						
Aircraft	1,234,364	40,848	40,259	65,201	275,670	958,694
Missiles	859,583	29,620	73,618	116,885	293,918	565,665
Tracked combat vehicles	466,051	23,437	5,042	12,968	198,401	267,650
Ordnance, vehicles and related equipment	5,215,009	332,457	296,842	265,812	2,118,480	3,096,529
Electronics and communications	860,795	40,892	31,168	34,171	272,859	587,936
Other procurement	856,930	37,777	61,764	54,150	344,295	512,635
Undistributed	—13,344	—	—	—	—	—13,344
Total—Procurement	9,479,388	505,030	508,694	549,185	3,503,621	5,975,767
Research, Development, Test, & Evaluation						
Military sciences	214,297	8,889	12,053	14,530	85,987	128,310
Aircraft	165,276	4,813	5,983	568	73,629	91,647
Missiles	769,920	26,455	24,433	19,378	405,495	364,425
Astronautics	15,450	940	41	13	4,130	11,320
Ordnance, vehicles and related equipment	227,029	11,515	9,360	5,872	98,402	128,627
Other equipment	455,813	25,753	17,711	26,976	148,207	307,606
Program-wide management and support	94,076	8,832	4,355	6,305	50,378	43,698
Undistributed	—51,300	—	—	—	—	—51,300
Research, Development, Test & Evaluation	1,890,561	87,200	73,933	73,642	866,228	1,024,332
	1,268,302	31,803	40,701	69,389	271,246	997,057
OF THE ARMY	29,224,764	2,084,241	1,851,343	2,136,178	13,033,723	16,191,042

DEPARTMENT OF THE NAVY

	Available for obligation	Obligations				Unobligated balance Dec. 31, 1967
		Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	
Military Personnel						
Active forces	5,473,700	454,360	462,519	471,695	2,743,146	2,730,554
Reserve forces	154,620	10,967	8,733	11,241	73,966	80,654
Total—Military Personnel	5,628,320	465,326	471,252	482,937	2,817,113	2,811,207
Operation and Maintenance	5,672,198	574,139	460,678	439,408	2,978,582	2,693,616
Procurement						
Aircraft	3,973,039	109,868	150,485	467,115	1,002,803	2,970,236
Missiles	774,243	63,942	30,664	43,254	286,445	487,798
Ships	4,884,230	107,612	173,716	96,764	709,429	4,174,801
Tracked combat vehicles	12,117	44	555	457	3,319	8,798
Ordnance, vehicles and related equipment	2,218,191	383,821	120,349	97,430	987,956	1,230,235
Electronics and communications	818,205	31,754	30,936	34,647	149,306	668,899
Other procurement	1,567,811	148,597	71,756	85,468	509,388	1,058,423
Undistributed	-448,947	—	—	—	—	-448,947
Total—Procurement	13,798,889	845,641	578,461	825,136	3,648,649	10,150,243
Research, Development, Test, and Evaluation						
Military sciences	203,309	14,260	8,554	11,211	97,489	106,820
Aircraft	377,724	12,546	12,456	15,374	97,365	280,359
Missiles	813,650	33,215	78,448	18,513	592,639	221,011
Astronautics	21,321	359	5,332	317	11,301	10,020
Ships	377,034	13,613	20,306	24,200	169,057	207,977
Ordnance, vehicles and related equipment	160,589	10,172	4,709	17,582	78,946	81,643
Other equipment	155,533	8,883	13,395	10,715	63,798	91,735
Program-wide management and support	350,702	25,814	17,775	24,546	128,097	222,605
Undistributed	-78,700	—	—	—	—	-78,700
Total Research, Development, Test & Eval.	2,381,162	118,862	160,975	122,458	1,238,692	1,142,470
Military Construction	1,075,638	53,778	27,408	35,766	201,634	874,004
TOTAL—DEPARTMENT OF THE NAVY	28,556,208	2,057,746	1,698,774	1,905,705	10,884,670	17,671,538

DEPARTMENT OF THE AIR FORCE

	Available for obligation	Obligations				Unobligated balance Dec. 31, 1967
		Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	
Military Personnel						
Active forces	5,647,300	475,141	465,304	522,160	2,883,509	2,763,791
Reserve forces	160,030	9,613	10,997	11,667	78,973	81,057
Total—Military Personnel	5,807,330	484,753	476,302	533,826	2,962,482	2,844,848
Operation and Maintenance	6,046,858	529,221	488,351	502,680	3,354,063	2,692,795
Procurement						
Aircraft	8,056,498	1,059,407	339,941	324,304	3,309,825	4,746,673
Missiles	1,620,265	130,207	78,204	94,162	560,305	1,059,960
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,689,671	49,803	104,448	25,652	960,918	728,753
Electronics and communications	570,284	36,604	32,554	19,734	203,451	366,833
Other Procurement	562,380	68,125	69,853	35,184	236,260	326,120
Undistributed	417,712	—	—	—	—	417,712
Total—Procurement	12,916,810	1,344,145	625,000	499,037	5,270,760	7,646,051
Research, Development, Test & Evaluation						
Military sciences	184,905	25,125	13,213	11,982	85,240	99,665
Aircraft	942,273	98,451	112,144	28,591	548,089	394,184
Missiles	982,983	164,641	26,291	69,406	637,916	345,067
Astronautics	1,253,114	116,242	68,269	60,932	561,046	692,068
Other equipment	324,172	21,442	20,220	15,601	164,917	159,255
Program-wide management and support	266,186	18,302	15,966	22,517	142,189	123,997
Undistributed	—112,269	—	—	—	—	—112,269
Total—Research, Development, Test & Eval.	3,841,362	444,200	256,106	209,026	2,139,395	1,701,967
Military Construction	698,859	18,184	8,332	15,441	124,676	569,183
TOTAL—DEPARTMENT OF THE AIR FORCE	29,306,219	2,820,504	1,854,090	1,760,010	13,851,376	15,454,843

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Dec. 31, 1967
		Oct. 1967	Nov. 1967	Dec. 1967	Cum. thru Dec. 31, 1967	
Military Personnel						
Retired Pay	2,020,000	168,139	169,683	175,245	1,009,379	1,010,621
Operation and Maintenance	1,035,128	94,112	79,296	84,871	521,806	513,322
Procurement						
Ordnance, Vehicles and related equipment	3,703	19	349	17	1,127	2,576
Electronics and communications	13,437	330	493	91	2,358	11,079
Other procurement	68,051	4,178	3,509	2,331	19,044	49,007
Undistributed	1,557	—	—	—	—	1,557
Total—Procurement	86,748	4,526	4,352	2,439	22,529	64,219
Research, Development, Test, and Evaluation				85,202	246,773	261,747
Military sciences	508,520	38,632	46,792	—	—	—
Emergency Fund	100,000	—	—	—	—	100,000
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test & Eval.	608,520	38,632	46,792	85,202	246,773	361,747
Military Construction	126,303	49	—16	—5	1,536	124,766
Family Housing	874,091	54,286	41,950	50,609	315,380	558,712
Other—Special Foreign Currency Program	16,344	123	32	13	168	16,176
TOTAL—DEFENSE AGENCIES/OSD	4,767,134	359,866	342,092	398,372	2,117,571	2,649,563

OFFICE OF CIVIL DEFENSE

Civil Defense	108,603	7,387	4,825	10,759	37,127	71,476
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MILITARY ASSISTANCE

Military Personnel	21	—2	—	—12	21	—
Operation and Maintenance	310,696	10,775	4,306	2,966	118,495	192,201
Procurement						
Aircraft	13,114	—1,644	—175	77	12,851	263
Missiles	—5,867	—262	—	—5,370	—6,032	165
Ships	5,609	—316	—	—199	5,547	62
Ordnance, vehicles and related equipment	21,139	—265	—	—2,347	21,142	—3
Electronics and communications	6,760	—2,716	—	—120	6,758	2
Other procurement	14,932	143	—21	1,453	14,474	458
Total—Procurement	55,687	—5,061	—196	—6,506	54,740	947
Research, Development, Test, and Evaluation	—1,300	—	—	—	—1,301	1
Military Construction	29,702	—41	—	101	—298	30,000
Undistributed	78	—	—	—7	—7	85
TOTAL—MILITARY ASSISTANCE	394,883	5,671	4,110	—3,458	171,649	223,234



GOVERNMENT PRINTING OFFICE PUBLICATIONS

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Documents on Disarmament, 1966. Contains basic official documents regarding international developments on disarmament, arms control, and related matters. Also includes a bibliography, a topical list of documents, and other bibliographic aids. 1967. 903 p. il. AC 1.11/2:966. \$2.50.

Cost Plus Award Fee Contracting Guide. Provides updated guidance and an aid in understanding current policies and concepts concerning the use of cost plus award fee contracts. 1967. 116 p. il. NAS 1.18:C82/3. 65¢.

NASA Incentive Contracting Guide. Provides authoritative guidance and sound precepts to all persons concerned with the negotiation and administration of incentive arrangements in NASA contracts. 1967. 142 p. il. NAS 1.18:In 2/2/967. 70¢.

U.S. Activities in Spacecraft Oceanography. An introduction to current U.S. research in the use of spacecraft for study of the oceans, presents some examples of opportunities for a broad extension of ocean observation techniques. 1967. 44 p. il. PrEx 12.2:Sp 1. 65¢.

Research Reports

Authorized DOD contractors and grantees may obtain these documents without charge from Defense Documentation Center
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Others may purchase these documents at a price of \$3 each (microfiche 65 cents), unless otherwise indicated, from:

Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

A Low-Cost Output Terminal For Time-Shared Computers. MIT, for the Advanced Research Projects Agency, March 1967, 31 p. Order No. AD-662 027.

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Associative Techniques for Control Functions in Multi-Processor Simulation Investigation. Honeywell Systems and Research Center, Griffiss AFB, N.Y. Dec. 1967, 147 p. Order No. AD-662 361.

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Miniature Probes for the Instantaneous Measurement of Enthalpy in Arc Jets. Cornwell Aeronautical Lab., Buffalo, N.Y., for the Air Force, Sept. 1967, 48 p. Order No. AD-662 644.

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Proceedings of the OAR Research Applications Conference, Vol. I. Office of Aerospace Research, USAF, Washington, D.C., March 1967, 242 p. Order No. AD-662 887.

Underwater Tools, Equipment, and Work Techniques—A Survey. Naval Civil Engineering Lab., Port Hueneme, Calif., Nov. 1967, 55 p. Order No. AD-662 221.

Superalloy Fibers — Mechanical Properties Versus Drawing Tech-

niques. Air Force Materials Lab., Wright-Patterson AFB, Ohio, Sept. 1967, 25 p. Order No. AD-662 871.

Deformation and Fracture as a Function of Strain Rate at Hot Working Temperatures. Materials Science & Engineering, Washington, D.C., for the Navy, Sept. 1967, 33 p. Order No. AD-662 411.

Hydrogen-Stress Cracking of 17-4PH Strainless. Aerospace Corp., El Segundo, Calif., for the Air Force, Aug. 1967, 26 p. Order No. AD-661 958.

Development of Configurations and Combinations of Polyurethane Foam to Produce Maximum Efficiency in Package Cushioning Materials. American Urethane, Inc., Los Angeles, for the Navy, May 1967, 141 p. Order No. AD-818 455.

Fluidized Bed Polymeric Coating of Large Steel Missile Container. Picatinny Arsenal, Dover, N.J., Oct. 1967, 13 p. Order No. AD-661 290.

An Approach to Radiation Source Design for Military Applications Utilizing the Wall-Stabilized ARC as an Example. Office of Aerospace Research, Wright-Patterson AFB, Ohio, Aug. 1967, 43 p. Order No. AD-662 350.

Pressure Equipment for Polymer Crystallization and DTA Under Pressure. Rensselaer Polytechnic Institute, Troy, N.Y., for the Navy, Dec. 1966, 28 p. Order No. AD-807 822.

Instruments for Use in Solid State Science Research. Naval Undersea Warfare Center, San Diego, Calif., Aug. 1967, 46 p. Order No. AD-663 121.

Calibration of Hot-Film Sensors in a Towing Tank and Application to Quantitative Turbulence Measurements. Naval Academy, Annapolis, Md., March 1967, 55 p. Order No. AD-663 098.

Beta-Ray Backscattering Gage for Measuring Paint Film Thickness. Naval Civil Engineering Lab., Port Hueneme, Calif., Dec. 1967, 25 p. Order No. AD-663 130.

On the Computational Solution of some Functional Equations in the Theory of Dynamic Programming. Rand Corp., Santa Monica, Calif., for the Air Force, Sept. 1954, 9 p. Order No. AD-85 990.

Life Support Needs for Vietnam Airmen Get Top Priority

Each day certain war reports from Vietnam are rushed to an office at the Aeronautical Systems Division (ASD), Air Force Systems Command, Wright-Patterson AFB, Ohio, and screened by a newly-formed group of engineers, physicians and combat-experienced Air Force officers.

The analysts belong to an organization called the Life Support System Program Office, which works closely with ASD's Deputy for Limited War in developing technology for South-east Asia operations.

Mission of the life support system analysts is to look for hints of equipment failure or personal suffering from climate, terrain, or exposure, and to develop equipment which will alleviate these problems.

The office has already been operating for more than 2 years and has tackled more than 100 separate projects. Most are designed to bolster the chances of survival of airmen who go down in the sea, mountains, or jungle.

Among the more urgent projects are:

- A better system for getting airmen out of crippled planes.
- A miniature, thoroughly reliable and long-lived radio battery.
- Lightweight body armor for cargo and helicopter crewmen.
- A method of supplying enough concentrated oxygen for two men in an aircraft.
- Improved flying helmets.
- Fire resistant gloves and flying suits.

New equipment must be reliable, simple to operate, timely, logistically supportable, and not too expensive. In addition, no solution, however good, can be allowed to hamper the airman's basic duty of operating effectively against the enemy.

Other items being developed to fill the needs of U.S. troops in Vietnam include:

- A forest penetrator rescue unit, a hinged, plastic hood that protects a survivor from injury while being hoisted out of the jungle.
- A pararescue transceiver helmet to provide pararescuemen with voice communications with rescue aircraft.
- A parachute lowering device which will permit a man to reach the

ground at a controlled rate of descent.

•Flares and launchers that can shoot well above the jungle foliage.

Also in development are such items as a compact life preserver that will fit under a man's arm; a harness for men who must work at the open doors of cargo aircraft and helicopters; automatic actuators to release life rafts and survival kits at a preset altitude during parachute descent; one-man life rafts; lap belts; chart holders; and fire resistant clothing.

To repair life rafts, a flexible adhesive patch is being sought that will work equally well whether wet or dry, and which can be applied with one hand.

Many recommendations are discarded, not because they are unworkable or unnecessary but because they have a limited use. Others are abandoned because airmen won't use them. Still others are scrapped because their value is not obvious to a man shaken up by a fall into strange or hostile environment. Because an airman's life may depend on how quickly he can learn to use the equipment in his kit, simplicity and obviousness are an essential ingredient of a survival package.

Colonel A. P. Lovelady, who formerly directed air rescue operations in Vietnam, is head of the Life Support Office at Wright-Patterson.

Retired Officers Set Convention in Florida, Nov. 13-15

The Retired Officers Association will hold its 19th biennial convention at the Jack Tar Hotel in Clearwater, Fla., Nov. 13-15, 1968.

The convention program includes presentations and exhibits by the Military Departments, designed to bring retired alumni up to date on current and future operational concepts of the Services.

Free exhibit space is being offered by the association this year and defense-oriented industries are invited to exhibit their products.

Interested exhibitors should contact Major General A. T. Wilson, Jr., USAF (RET.) or Lieutenant Colonel Sheldon Hicks, USAR (Ret.), Retired Officers Association, 1625 Eye St. NW, Washington, D.C. 20006, telephone (202) 788-8765.

Cambridge Research Lab Adds New Branch

The Air Force Cambridge Research Laboratory has increased its branches from nine to ten with the addition of a newly established Ionospheric Physics Laboratory.

The new laboratory was formed by reorganizing the radio astronomy programs of the Space Physics Laboratory and the ionospheric programs of the Upper Atmosphere Physics Laboratory under one branch.

All other missions of the laboratories branches will remain the same under the reorganization except for a name change redesignating the Upper Atmosphere Physics Laboratory as the Aeronomy Laboratory.

Christos G. Stergis, previous Director of the Upper Atmosphere Physics Laboratory, will remain as head of the Aeronomy Laboratory.

Lieutenant Colonel Thomas D. N. Douthitt, previous Director of the Space Physics Laboratory, now heads the new Ionospheric Physics Laboratory.

Adolph S. Jursa, previously assigned to the Upper Atmosphere Physics Laboratory, has been selected to serve as Acting Director of the Space Physics Laboratory.

AFCEA Annual Meeting Set for May 14-16

The annual convention and exhibition of the Armed Forces Communications and Electronics Association will be held May 14-16 at the Sheraton Park Hotel, Washington, D.C.

Admiral Thomas H. Moorer, Chief of Naval Operations, will speak at the keynote luncheon on May 14, and Lieutenant General Alfred D. Starbird, USA, Sentinel System Manager, will address the industrial luncheon on May 16. Banquet speaker on the evening of May 15 will be Lawrence A. Hyland, Vice President and General Manager of Hughes Aircraft Co.

Technical panel presentations on various aspects of communications and electronics are planned for each of the three days of the convention.

For additional information the contact is: W. J. Baird, Armed Forces Communications and Electronics Association, 1725 Eye St. NW, Washington, D.C. 20006, telephone (202) 296-3033.

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	III	IV	Oct	Nov	Dec	IV	1968 Jan	Feb
I. Military Prime Contract Awards														
Aircraft.....	\$1,945	\$2,989	\$2,696	\$2,262	\$2,103	\$3,049	\$2,513	\$1,249	\$578		\$805	\$2,632	\$442	\$478(P)
Missile & Space Systems.....	1,040	987	1,314	861	1,230	1,166	1,580	323	429		316	1,068	348	475(P)
Ships.....	355	491	876	239	679	407	417	153	147		110	410	109	122(P)
Weapons & Ammunition.....	555	1,486	692	940	818	1,769	1,104	454	451		439	1,344	226	373(P)
Electronic & Communications Equip.....	918	1,574	666	915	971	1,848	816	272	247		305	824	359	290(P)
Other Hard Goods.....	843	1,842	660	1,029	915	1,564	785	252	153		248	653	246	331(P)
Soft Goods.....	709	922	1,078	989	688	652	1,056	175	118		198	491	437	137(P)
Construction.....	207	392	193	130	232	626	232	56	44		113	213	61	63(P)
All Other.....	1,406	1,963	2,356	1,639	1,605	1,987	2,335	522	486		649	1,657	457	551(P)
Total (Excl. Work Outside U. S.).....	7,978	12,646	10,536	9,024	9,190	13,068	10,838	3,456	2,653		3,183	9,292	2,687	2,770(P)
Total Seasonally Adjusted.....	8,703	10,144	10,716	10,149	10,171	10,667	10,961	3,626(R)	3,308(R)		3,479(R)	10,413(R)	2,887(R)	3,445(P)
Work Outside U. S.	521	1,195	856	672	453	834	891	193	117		145	455	288	139(P)
II. Gross Obligations Incurred														
Operations.....	8,326	9,604	10,426	9,702	10,229	11,435	11,224	3,776	3,374		3,663	10,812	3,798	
Procurement.....	4,374	8,339	5,368	5,276	5,113	8,948	6,154	2,699	1,717		1,876	6,292	1,784	
Other.....	2,429	3,470	3,453	2,230	2,519	3,510	3,420	860	665		669	2,194	863	
Total.....	15,129	21,613	19,247	17,208	17,861	23,893	20,798	7,335	5,755		6,208	19,298	6,445	
III. Gross Unpaid Obligations Outstanding														
Operations.....	3,828	3,777	4,792	5,024	4,644	4,513	5,267	5,270	5,030		5,150	5,150	5,127	
Procurement.....	18,023	22,119	22,736	23,173	22,780	25,248	24,925	25,423	24,982		24,856	24,856	24,197	
Other*.....	5,625	5,942	8,026	7,253	6,996	7,506	7,978	7,854	7,609		7,360	7,360	7,329	
Total.....	27,476	31,838	35,554	35,450	34,420	37,267	38,170	38,547	37,641		37,366	37,366	36,663	
IV. Net Expenditures														
Operations.....	7,689	9,076	8,968	9,087	10,002	10,731	10,001	3,641	3,456		3,397	10,494	3,550	
Procurement.....	3,651	3,886	4,392	4,264	3,074	5,282	6,060	2,005	1,890		1,704	5,598	2,274	
Other.....	2,757	2,647	2,484	3,092	3,160	2,001	3,047	790	847		724	2,363	1,153	
Total.....	14,097	15,609	15,844	16,443	18,236	18,014	19,108	6,436	6,194		5,825	18,455	6,977	
V. DOD Personel Compensation														
Military.....	3,181	3,249	3,551	3,606	3,624	3,646	3,842	1,264	1,297		1,411	3,972	1,338	
Civilian.....	1,937	2,015	2,105	2,135	2,170	2,248	3,271	773	772		787	2,332	898	
Total.....	5,118	5,264	5,656	5,741	5,794	5,894	6,113	2,037	2,069		2,198	6,304	2,166	
VI. Outstanding Payments														
Advance Payments.....	66	79	90	83	92	80	110					134		
Progress Payments.....	4,402	4,346	4,750	5,461	5,981	6,765	7,179					7,491		
Total.....	4,468	4,425	4,840	5,544	6,073	6,845	7,289					7,625		
VII. Strength (Manpower)														
Military.....	2,969	3,094	3,229	3,334	3,371	3,377	3,412	3,416	3,412		3,398	3,398	3,427(P)	
Civilian.....	1,088	1,138	1,184	1,230	1,268	1,303	1,274	1,277	1,277		1,271	1,271	1,267	
Total.....	4,057	4,232	4,413	4,564	4,639	4,680	4,686	4,693	4,689		4,669	4,669	4,694	1,265(P)

NA=Not Available.

P = Preliminary.

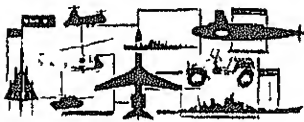
R = Revised.

* = Entire series adjusted to exclude revolving funds.

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication.

Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
March 27, 1968



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of March 1968:

DEFENSE SUPPLY AGENCY

- 1—Coastal States Petrochemical Co., \$1,300,348 14,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1282
- Signal Oil & Gas Co., Houston, Tex. \$3,212,500 35,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1648
- Southwestern Oil & Refining Co., Corpus Christi, Tex. \$4,312,140 46,200,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1649
- Atlantic Richfield, Co., Los Angeles, Calif. \$2,220,750 21,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1013
- 4—Apparel Corp. of America, Knoxville, Tenn. \$4,049,908 780,075 coated nylon twill ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1710
- Electro Plastics Fabrics, Pulaski, Va. \$1,311,179 236,675 coated nylon twill ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1711
- 6—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for aviation gasoline:
 - Humble Oil & Refining Co., Houston, Tex. \$16,775,863 117,933,000 gallons of grade 115/145. DSA 600-68-D-1400
 - Mobile Oil Corp., New York, N.Y. \$14,222,481 97,321,000 gallons of grade 115/145 and 2,800,000 gallons of grade 80/87. DSA 600-68-D-1401
 - Atlantic Richfield Co., Los Angeles, Calif. \$5,545,924 33,814,000 gallons of grade 115/145. DSA 600-68-D-1395
 - Texaco, Inc., New York, N.Y. \$5,253,444 37,700,000 gallons of grade 115/145. DSA 600-68-D-1400
 - Gulf Oil Corp., New York, N.Y. \$3,966,228 28,140,000 gallons of grade 115/145. DSA 600-68-D-1399
 - Phillips Petroleum Co., Bartlesville, Okla. \$3,531,849 24,302,000 gallons of grade 115/145 and 20,000 gallons of grade 100/130. DSA 600-68-D-1402
 - Union Oil Co., Los Angeles, Calif. \$2,783,400 17,001,000 gallons of grade 115/145 and 30,000 gallons of grade 80/87. DSA 600-68-D-1408
 - Texas City Refining, Inc., Texas City, Tex. \$1,170,000 18,400,000 gallons of grade 115/145. DSA 600-68-D-1407
- Standard Oil Co., Louisville, Ky. \$2,569,420 18,432,000 gallons of grade 115/145. DSA 600-68-D-1404
- Standard Oil Co., San Francisco, Calif. \$2,507,643 847,000 gallons of combat Type II automotive gasoline and 17,224,000 gallons of grade DF-A Arctic diesel fuel. DSA 600-68-C-1105
- 8—Genesco, Inc., Nashville, Tenn. \$4,151,551 486,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1353

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency.

- Hi-Pala Footwear, Inc., Waynesville, N.C. \$2,022,604 230,040 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1351
- Randolph Mfg. Co., Randolph, Mass. \$1,724,000 200,000 tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1352
- Delta Petroleum Co., New Orleans, La. \$1,556,987 3,916,757 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0048
- 11—Sparling Mills, Greenville, R.I. \$1,125,960 6,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4471 P001
- Pioneer Bag Co., Kansas City, Mo. \$8,753,085 45,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4469 P001
- Lite Industries, Paterson, N.J. \$1,420,000 7,100,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4480 P001
- Cavaller Bag Co., Lumberton, N.C. \$3,196,428 15,900,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4484 P001
- Uniplex, Inc., Paramount, Calif. \$4,437,158 22,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-4476 P001
- 12—Reflective Laminates, Inc., North Hollywood, Calif. \$1,086,538 8,002 sets of small arms protective body armor for crewmen, and 155 separate plates for such armor. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1796
- West Point-Pepperell, Inc., New York, N.Y. \$1,502,390 3,000,000 white cotton bath towels. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1782
- 13—Republic Steel, Chicago, Ill. \$3,262,796 340,938 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-D-0056-0000
- 14—South Jersey Clothing Co., Minicola, N.J. \$1,181,073 54,730 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1803
- 10—Glenn Barry Mfg., Inc., Commerce, Okla. \$1,292,738 1,629,200 pairs of men's cotton slacks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1849
- 21—Shell Oil Co., New York, N.Y. \$2,108,880 1,500,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1454
- 25—Humble Oil & Refining Co., Houston, Tex. \$2,319,920 24,400,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1671
- Texaco, Inc., New York, N.Y. \$5,951,610 63,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1672
- Gulf Oil Corp., New York, N.Y. \$1,590,960 16,800,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1670
- Coastal States Petrochemical Co., Houston, Tex. \$2,032,905 21,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1668
- Cities Service Oil Co., New York, N.Y. \$1,612,917 16,800,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1667
- Gibraltar Fabrics, Brooklyn, N.Y. \$2,977,280 421,080 poncho liners. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1883
- Tony Downs Food Co., St. James, Minn. \$1,022,266 358,920 dozen cases of boxed chicken. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-22023
- Booth Packing Co., Modesto, Calif. \$1,210,305 1,531,560 cases of individual combat meals. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-092A3
- Aluminum Co. of America, Pittsburgh, Pa. \$2,335,308 7,074,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-68-C-5117
- Valley Metallurgical Processing Co., Essex, Conn. \$1,972,380 6,500,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-68-C-5116
- 26—Remington Oil Co., New York, N.Y. \$2,253,960 1,096,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1452
- Gulf Oil, Houston, Tex. \$1,333,447 207,700 barrels of diesel fuel and 51,700 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1437
- 27—Humble Oil & Refining Co., Houston, Tex. \$2,663,052 42,850 barrels of diesel fuel and 1,164,300 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1140
- Mobil Oil Corp., New York, N.Y. \$1,604,730 6,000 gallons of gasoline; 213,000 barrels of diesel fuel and 325,360 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1446
- Lukens Steel Co., Coatesville, Pa. \$6,151,260 13,028,014 lbs. of HY-80 alloy steel plate. Defense Industrial Supply Center, Philadelphia, Pa. DSA 500-68-C-0114
- 28—Eastman Kodak Co., Rochester, N.Y. \$2,851,774 Seventy-nine line items of aerial film and associated chemicals. Defense General Supply Center, Richmond, Va. DSA 400-68-C-0263-0001
- 29—Chase Bag Co., New York, N.Y. \$2,343,540 11,223,000 polypropylene sandbags (containerized). Defense General Supply Center, Richmond, Va. DSA 400-68-C-5178
- Crowley Industrial Bag Co., Crowley, La. \$1,505,000 7,000,000 polypropylene sandbags (containerized). Defense General Supply Center, Richmond, Va. DSA 400-68-C-5176
- Continental Bag Co., Inc., Crowley, La. \$1,372,555 7,000,000 polypropylene sandbags (containerized). Defense General Supply Center, Richmond, Va. DSA 400-68-C-5177



DEPARTMENT OF THE ARMY

- 1—Philco Ford Corp., Newport Beach, Calif. \$15,697,400 Chaparral fire units and components. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0548
- General Motors, Indianapolis, Ind. \$4,650,605 Turbo shaft engines for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1289
- PMC Corp., Santa Clara, Calif. \$17,039,000 Metal parts for high explosive projectiles. Army Procurement Agency, Oakland, Calif. DA-AG05-68-C-0058
- Mattner & McCutchen-Osherg Construction Co., Seattle, Wash. \$3,491,520 Construction of a ventilation system at the Flathead Tunnel on the Great Northern Railroad, Libby, Mont. Engineer Dist., Seattle, Wash. DA-CW67-68-C-0049
- General Time Corp., La Salle, Ill. \$1,030,425 Fuzes for artillery ammunition. Frankford Arsenal, Philadelphia, Pa. DA-30038-AMC-4243A

- Day & Zimmerman, Inc., Philadelphia, Pa. \$17,736,221. Loading, assembling and packing of miscellaneous ammunition items. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00114 (A).
- Philco Ford Corp., Newport Beach, Calif. \$8,250,000. Shillelagh guided missiles. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1402.
- Martin Marietta Corp., Orlando, Fla. \$8,406,576. Shillelagh guided missiles. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1020.
- Continental Motors, Muskegon, Mich. \$6,247,038. Multi-fuel engines assemblies for 2½-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1657.
- Teledyne Systems, Northridge, Calif. \$3,600,000. Five sets of central computer complex components with associated equipment for use in AH-56A aircraft. Electronics Command, Fort Monmouth, N.J.
- 4—Dan Catuto Co., San Jose, Calif. \$2,965,733. Improvements on Walnut Creek Channel, Walnut Creek, Calif. Engineer Dist., Sacramento, Calif. DA-CW05-68-C-0052.
- Mason & Hanger, Silas Mason & Co., Lexington, Ky. \$2,353,313. Operation of the Cornhusker Army Ammunition Plant, Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00019 (A).
- Sargent-Fletcher Co., El Monte, Calif. \$1,288,828. Spray tanks. Edgewood Arsenal, Edgewood, Md. DA-AA15-67-C-0049.
- National Union Electric Corp., Bloomington, Ill. \$1,046,400. Metal parts for a classified end item. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0055.
- 5—LTV Aero-Space Corp., Warren, Mich. \$2,477,878. Ground support equipment for the Lance missile system. Army Missile Command, Huntsville, Ala. DA-20-113-AMC-01062 (Z).
- Cabot Corp., Tampa, Tex. \$1,126,872. Machining of steel tube forgings into gun barrels for 162mm cannons. Kingsmill, Tex. Watervliet Arsenal, Watervliet, N.Y. DA-AF07-68-C-0068.
- White Motors, Lansing, Mich. \$1,002,282. Engineering services for 2½-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-6674.
- 6—Günther-Shirley-Lane, Sherman Oaks, Calif. \$5,181,140. Completion of a power house at Robert S. Kerr Lock and Dam on the Arkansas River, near Sallisaw, Okla. Engineer Dist., Tulsa, Okla. DA-CW-58-68-C-0107.
- 8—Bell Aerospace Corp., Fort Worth, Tex. \$20,752,354. Light observation helicopters. Wichita, Kan. and Tarrant County, Tex. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1698.
- A. O. Smith Corp., Chicago, Ill. \$3,375,300. 750-lb. bomb metal parts. Bellmead, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0078.
- Bell Aerospace Corp., Fort Worth, Tex. \$3,310,368. UH-1 helicopter rotary wing blades. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0022.
- Texas Instruments, Inc., Dallas, Tex. \$1,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- 11—Raytheon Co., Andover, Mass. \$1,649,500. Oscillators for Hawk missile system ground equipment. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0061.
- Ballenger Paving Co., Greenville, N.C. \$2,120,098. Construction of a barricaded rail holding yard for 360 rail cars, including support utilities, earth barricade and railroad tracks. Sunnypoint Army Terminal, N.C. Engineer Dist., Savannah, Ga. DA-CA21-68-C-0045.
- 12—Eugene Lühr & Co., and the Pine Bluff Sand & Gravel Co., Pine Bluff, Ark. \$1,950,350. Construction of dredging for navigation channel in Pool No. 7, Arkansas River Navigation Project. Conway, Perry, Faulkner and Pulaski Counties, Arkansas. Engineer Dist., Little Rock, Ark. DA-CW03-68-C-0052.
- AVCO Corp., Stratford, Conn. \$5,078,830. Spare parts for T-65-1-11 engines for OH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-2292.
- Bell Aerospace Corp., Wheatfield, N.Y. \$1,380,000. Three air cushion vehicles. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-0656.
- 13—Philco-Ford Corp., Philadelphia, Pa. \$1,273,500. Engineering changes in connection with Secure Voice Access System. Electronics Command, Fort Monmouth, N.J. DA-AB07-67-C-0153.
- 14—Pace Corp., Memphis, Tenn. \$3,728,535. Illumination signals. Camden, Ark. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0543.
- 15—Barter Engineering Corp., Harrisburg, Ill. \$7,678,793. Construction and excavation work on the Rend Lake Reservoir project. Franklin and Jefferson Counties, Ill. Engineer Dist., St. Louis, Mo. DA-CW43-68-C-0001.
- Oman Construction Co., Nashville, Tenn. \$1,479,950. Clearing and stripping an embankment and construction of a temporary coffer dam at the Laurel River Reservoir Project. Laurel and Whitley Counties, Ky. Engineer Dist., Nashville, Tenn. DA-CW62-68-C-0111.
- Mike Hooks, Inc., Lake Charles, La. \$1,447,540. Dredging, construction and appurtenant work for the Calcasieu River and Navigation Channel Project. Cameron Parish, La. Engineer Dist., New Orleans, La. DA-CW29-68-C-0140.
- Eugene Lühr & Co., Columbia, Ill. and Midwest Construction Co., Nebraska City, Neb. \$1,504,314. Work on the Snake Creek embankment. Cole Harbor, N.D. DA-CW46-68-C-0090.
- Watson Automotive Equipment Co., Detroit, Mich. \$1,070,304. 150 ambulance automobiles. Koscusko, Miss. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1728.
- Allis Chalmers Mfg. Co., York, Pa. \$3,206,770. Turbines for the Dvorskak Dam and Reservoir project. Engineer Dist., Walla Walla, Wash. DA-CW68-68-C-0060.
- 18—AVCO Corp., Stratford, Conn. \$2,688,400. Gas turbine engine components for the UH-1 aircraft. Aviation Materiel Command, St. Louis, Mo. F-41-608-67-A-3234.
- Chandler Evans, Inc., West Hartford, Conn. \$2,512,104. Main fuel controls for UH-1 aircraft. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-A-0008.
- Hughes Tool Co., Culver City, Calif. \$1,148,056. Transmission assemblies for OH6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-23-204-AMC-03697.
- 19—Hercules, Inc., Wilmington, Del. \$9,360,000. Loading, assembling and packing mines. Magna, Utah. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0370.
- AVCO Corp., Stratford, Conn. \$3,604,574. Spare parts for CH-47 helicopter engines. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-2292.
- Magnavox Co., Fort Wayne, Ind. \$1,522,600. Radio sets and related maintenance kits. Electronics Command, Fort Monmouth, N.J. F-34-601-68-A-1489.
- 20—R. B. Burch, Inc., Cedar Rapids, Iowa. \$3,998,434. County road relocation in Appanoose, Lucas and Wayne Counties, Iowa. Engineer Dist., Kansas City, Mo. DA-CW41-68-C-0120.
- Westinghouse Electric, Birmingham, Ala. \$2,766,807. Design, manufacture, delivery, installation and testing of KVA alternating current generators and appurtenances. Pittsburgh, Pa. and Benton, Ala. Engineer Dist., Mobile, Ala. DA-CW01-68-C-0076.
- Norris Industries, Everett, Mass. \$1,777,279. 60mm rocket launchers. Brockton, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0338.
- Lockheed Aircraft, Burbank, Calif. \$1,500,000. Ground support equipment for AH56A helicopters. Van Nuys, Calif. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1749.
- Raytheon Co., Lexington, Mass. \$1,146,650. 750-lb. bomb tail fuzes. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0027.
- 21—General Electric, Burlington, Vt. \$2,972,517. Spare parts for the XM12 armament pod and the M61A1 gun. Army Procurement Agency, New York, N.Y. DA-AF03-67-C-0016.
- Jackes-Evans Mfg. Co., St. Louis, Mo. \$2,948,990. 7.62mm ammunition links. Army Procurement Agency, Chicago, Ill. DA-AG11-68-C-1152.
- Stewart Avionics, Inc., Brooklyn, N.Y. \$2,237,721. Maintenance of truck mounted shop equipment. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-6230.
- United Ammunition Container Corp., Philadelphia, Pa. \$1,930,320. Ammunition fiber containers for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0360.
- Consolidated Box Co., Tampa, Fla. \$1,916,200. Ammunition fiber containers for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0361.
- Dyer & Dyer, Inc., Elizabethtown, Ky. \$1,221,825. Construction of flood protection work at the Frankfort, Ky. local protection project. Engineer Dist., Louisville, Ky. DA-CW27-68-C-0127.
- San Ore-Gardner, Houston, Tex. \$1,072,427. Construction of a marine terminal administration and storage buildings, reinforced concrete wharf and other appurtenant work at Pine Bluff, Ark. Engineer Dist., Little Rock, Ark. DA-CW03-68-C-0050.
- 22—Northrop-Carolina, Inc., Asheville, N.D. \$4,440,800. CS-1 riot control agent. Swannanoa, N.C. Edgewood Arsenal, Md. DA-AA16-68-C-0482.
- General Electric, Burlington, Vt. \$4,092,000. 20mm anti-aircraft artillery systems. Procurement Agency, New York, N.Y. DA-AG26-68-C-0019.
- Eastman Kodak Co., Rochester, N.Y. \$6,556,094. Manufacture of explosives and maintenance of facilities. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00035 (A).
- Batesville Mfg. Co., Batesville, Ark. \$2,395,800. 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0053.
- Lear Siegler, Inc., Anaheim, Calif. \$2,168,430. Metal parts for artillery shell fuse components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0376.
- R. C. Can Co., Hazlewood, Mo. \$1,955,600. Fiber ammunition containers for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-00377.
- National Presto Industries, Inc., Eau Claire, Wis. \$1,299,734. Facilities for manufacturing metal parts for M100 8-inch shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0341.
- Wells Marine, El Segundo, Calif. \$1,155,000. Metal parts for various types of components for artillery shell fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0356.
- National Union Electric Corp., Bloomington, Ill. \$1,052,295. 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0258.
- 25—Mason & Hanger, Silas Mason Co., New York, N.Y. \$13,695,853. Loading, assembling and packing of medium and large caliber ammunition, components and mines. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00085 (A).
- Philco-Ford Corp., Philadelphia, Pa. \$1,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- Atlantic Gulf & Pacific Co., New York, N.Y. \$1,039,884. Maintenance dredging of material from the Port Arthur Canal and Lower Reach of the Sabine-Neches Canal. Jefferson County, Tex. Engineer Dist., Galveston, Tex. DA-CW64-68-C-0094.
- General Motors, Detroit, Mich. \$9,202,822. Metal parts for 105mm projectiles. St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0060.
- Bell Aerospace Corp., Fort Worth, Tex. \$10,727,908. AH-1G helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-C-0043.
- Cumerford Mfg. Co., Anaheim, Calif. \$1,343,250. 7.62mm links. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0461.
- Borg Warner Corp., Bellwood, Ill. \$1,110,900. 7.62mm links. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0635.
- 26—Trinity Construction Co., Houston, Tex. \$1,312,521. Flood control work on the Vince and Little Vince Bayou Project. Harris County, Tex. Engineer Dist., Galveston, Tex. DA-CW64-C-0095.

- Mine Safety Appliances Co., Pittsburgh, Pa. \$1,300,000. Riot control agent masks. Edgewood Arsenal, Edgewood, Md. DA-AA15-68-C-0488.
- Northrop Corp., Anaheim, Calif. \$1,181,781. 152mm canisters. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0764.
- 27-Grand Machining Co., Detroit, Mich. \$1,529,409. M119 fu assemblies for the 81mm mortar. Vero Beach, Fla. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0039.
- General Motors, Cleveland, Ohio. \$1,842,428. Spare parts for M551 vehicles. Army Weapons Command, Rock Island, Ill. DA-11-109-AMC-00610 (W).
- Sylvania Electric Products, Inc., Mountain View, Calif. \$2,500,000. Classified electronic equipment. Central Procurement Activity, Vint Hill Farms Station, Washington, Va. DA-HC07-68-C-0166.
- General Motors, Indianapolis, Ind. \$3,556,525. XTE-250-1A transmissions with spare parts for M551 vehicles. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0442.
- Atlantic Gulf & Pacific Co., New York, N.Y. \$1,162,988. Maintenance dredging of the Houston, Tex., ship channel. Engineer Dist., Galveston, Tex. DA CW64-68-C-0096.
- AVCO Corp., Stratford, Conn. \$1,071,785. Technical publications in support of T55 and T53 turbine aircraft engines. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1131.
- Colts, Inc., Hartford, Conn. \$1,081,728. 20-round magazine assemblies in support of the M16 weapons family. Army Weapons Command, Rock Island, Ill. DA-AF08-68-C-0040.
- 28-Philco-Ford Corp., Newport Beach, Calif. \$1,753,909. Shillengh engineering services. Army Missile Command, Huntsville, Ala. DA-04-405-AMC-00566 (Z).
- Muncie Gear Works, Muncie, Ind. \$3,351,500. Fin and nozzle assemblies for 275-inch rockets. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0782.
- Hendry Corp., Tampa, Fla. \$1,280,165. Clearing and dredging work in the Alabama River Channel. Engineer Dist., Mobile, Ala. DA CW01-68-C-0081.
- Colts, Inc., Hartford, Conn. \$1,249,132. Sixty-six line items of repair parts for M16 weapon family. Army Weapons Command, Rock Island, Ill. DA-AF03-68-C-0051.
- 29-Allegany Ludlum Steel Corp., Pittsburgh, Pa. \$1,023,207. 2,026,152 lbs. of bullet jacket cup gilding metal clad steel for 7.62mm ball ammunition, M80 and/or 30 cal. ball (M2) ammunition. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0247.
- Raytheon Co., Lexington, Mass. \$1,956,460. Self-propelled Hawk missile system ground support equipment. Andover, Mass. and Bristol, Tenn. Army Missile Command, Huntsville, Ala. DA-AH01-67-C-A024.
- Teletype Corp., Skokie, Ill. \$1,500,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- Motorola, Inc., Scottsdale, Ariz. \$2,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- Philco-Ford Corp., Philadelphia, Pa. \$3,195,008. Three months maintenance and operation services for the Integrated Wide Band Communication Sites in Southeast Asia. Electronics Command, Fort Monmouth, N.J. DA-28-043-AMC-01694 (E).
- Honeywell, Inc., Tampa, Fla. \$2,124,070. Multiplexers and related spare parts kits. Electronics Command, Philadelphia, Pa. DA-AB05-67-C-1225.
- Cummins Engine Co., Columbus, Ind. \$1,048,510. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5022.
- Continental Motors, Muskegon, Mich. \$10,079,764. AYDS1790 engine assemblies. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0407.
- American Hoist & Derrick Co., St. Paul, Minn. \$14,459,620. Wheel mounted, 20-ton cranes. Bay City, Mich. and Fort Wayne, Ind. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-6809.
- Wisconsin Motor Corp., Milwaukee, Wis. \$7,148,091. Ten and twenty horsepower military standard gasoline engines. Mobility Equipment Command, St. Louis, Mo. DA-HC60-68-C-0017.
- Western Electric, New York, N.Y. \$85,480,628. Initial production of the Sentinel anti-ballistic missile system. Sentinel System Command, Huntsville, Ala. DA-HC60-68-C-0017.
- General Dynamics, Pomona, Calif. \$3,479,000. XM49-E3 trainers for the Redeye missile system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1582.
- Kaiser Jeep Corp., Toledo, Ohio. \$34,207,500. Five-ton trucks. South Bend, Ind. DA-AE06-68-C-0012, \$7,451,637. 1 1/2-ton trucks. Project Manager, General Purpose Vehicle Agency, Warren, Mich. DA-20-113-AMC-10235.
- Mack Trucks, Allentown, Pa. \$8,278,908. Diesel engines for five-ton trucks. Hagerstown, Md. Project Manager, General Purpose Vehicle Agency, Warren, Mich. DA-AE06-68-C-0010.
- Sullivan Township Road Dist., Sullivan, Ill. \$1,100,000. Work on the Shelbyville Reservoir, Moultrie County, Ill. Engineer Dist., St. Louis, Mo. DA-CW43-68-C-0102.
- General Motors, Indianapolis, Ind. \$1,158,000. Production improvement program for the T-63-A-5A engine for OH-6A helicopters. DA-AJ01-67-C-1702, \$1,679,210. T-63-A-6A engines. DA-AJ01-68-C-1333. Aviation Materiel Command, St. Louis, Mo.
- AVCO Corp., Stratford Conn. \$1,087,887. Technical non-personnel services and supplies for CY 1968. T-55 engine product improvement program. DA-AJ01-68-C-1543, \$2,582,000. Product support and component improvement program for T-53 engines. DA-AJ01-68-C-1544; \$15,871,701. T-53 engines. DA-AJ01-67-C-0647. Aviation Materiel Command, St. Louis, Mo.
- Bell Helicopter, Fort Worth, Tex. \$8,121,517. Rotary wing blades and associated parts, and main blade assemblies for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0022.
- Hercules, Inc., Wilmington, Del. \$14,361,873. Production of propellant for 275-inch rockets and maintenance of production facilities at the Sunflower Ammunition Plant, Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-0042 (A).
- Appalachian Power Co., New York, N.Y. \$1,620,000. Operation of a facility for power to support production requirements at the Radford, Va., Army Ammunition Plant. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00134 (A).
- Norris Industries, Los Angeles, Calif. \$1,181,660. Metal parts for 81mm mortar projectiles. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0304.
- Lehigh, Inc., Easton, Pa. \$2,499,910. Metal parts for high explosive warheads for 275-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0200.
- Olin Mathieson Chemical Co., East Alton, Ill. \$1,839,178. 81mm illuminating projectiles. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-61.
- Bell & Howell Co., Chicago, Ill. \$1,174,758. Metal parts for 81mm illuminating projectiles. Evanston, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0047.
- Kleco Co., St. Louis, Mo. \$6,457,500. Metal parts for 105mm cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0108.
- Dulova Watch Co., Flushing, N.Y. \$5,196,800. Mechanical time fuses (M565). Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00316 (A).
- General Instrument Corp., Chicopee, Mass. \$2,000,000. Metal parts for bomb tail fuses. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0086.
- Delaware Valley Armaments, Mt. Laurel, N.J. \$1,290,000. Metal parts for point detonating fuses. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0204.
- National Union Electric Corp., Bloomington, Ill. \$1,392,650. Metal parts for 750-lb. bomb nose fuses. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0386.
- National Presto Industries, Eau Claire, Wis. \$9,855,441. Metal parts for eight-inch high explosive projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-820 (A).
- Atlantic Research Corp., West Hanover, Mass. \$3,000,000. Incorporation of a new design for the explosive opener assembly on a mine system. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0323.



DEPARTMENT OF THE NAVY

- 1-Sanders Associates, Nashun, N.H. \$8,000,000. Electronic equipment. Naval Air Systems Command, Now 65-0356.
- Garrett Corp., Phoenix, Ariz. \$4,664,400. T76-G-10/12 engines and special support equipment. Naval Air Systems Command, Now 65-0167.
- Treadwell Corp., New York, N.Y. \$2,798,115. Oxygen generators, related technical services and data. Naval Ship Systems Command N00024-68-C-5212.
- Consolidated Diesel Electric Co., Old Greenwich, Conn. \$1,410,750. Aircraft spotting dollies. Naval Air Systems Command, N00019-68-C-0394.
- 4-Harvey Aluminum Co., Torrance, Calif. \$1,584,000. WRETEYE bombs. Naval Air Systems Command, N00019-68-C-0325.
- 5-Western Electric, New York, N.Y. \$1,211,865. Production of Tatar weapon direction equipment. Burlington, N.C. Naval Ordnance Systems Command, N00017-68-C-2310.
- 6-Ingalls Shipbuilding Corp., Pascagoula, Miss. \$113,072,000. Design and construction of four ammunition ships. Naval Ship Systems Command, N00024-68-C-0287.
- Cubic Corp., San Diego, Calif. \$3,750,000. Classified electronic equipment. Naval Ship Systems Command, N00024-68-C-1179.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,720,900. TC-4C aircraft. Naval Air Systems Command, N00019-67-C-0180.
- 7-Aerofac-General Corp., Azusa, Calif. \$12,000,000. MK 46 MOD 1 torpedoes and associated equipment. Naval Ordnance Systems Command, N00017-67-C-1108.
- Sperry Rand Corp., St. Paul, Minn. \$2,712,203. Data processing sets. Naval Ship Systems Command, N00024-68-C-1184.
- Rendic Corp., Teterboro, N.J. \$1,779,835. Autopilot systems. Naval Air Systems Command, N00019-68-C-0276.
- Philco-Ford Corp., Fort Washington, Pa. \$1,030,000. Improvement of maintainability and reliability of sonar equipment. Naval Ship Systems Command, N00024-68-C-1132.
- Northrop Corp., Hawthorne, Calif. \$1,024,240. Airborne Omega receiver navigation sets. Naval Air Systems Command, N00019-68-C-0355.
- 8-Logicon, Inc., San Pedro, Calif. \$3,691,611. Development of a prototype computerized Airborne Tactical Data System program for the Fleet Computer Program Center, Pacific, San Diego, Calif. Navy Purchasing Office, Los Angeles, Calif. N00128-68-C-0091.
- Raytheon Co., Lexington, Mass. \$2,060,713. MK 42 MOD 0 firing mechanisms. Bristol, Tenn. Naval Ordnance Systems Command, N00017-68-C-1415.
- Rodale Electronics, Garden City, N.Y. \$1,118,700. Telemetric transmitting sets for testing surface-to-air missiles. Naval Avionics Facility, Indianapolis, Ind. N00163-68-C-0488.
- 11-Hughes Aircraft, Culver City, Calif. \$13,324,000. Phoenix missiles and associated equipment. Naval Air Systems Command, N00019-68-C-0295.

- General Dynamics, Pomona, Calif. \$5,000,000. Increase to the limitation of authorization for the Standard Arm missile system. Naval Air Systems Command. N00019-67-C-0399
- Poloron Products, New Rochelle, N.Y. \$2,105,321. MK 82 bomb fin assemblies. Scranton, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.
- Dayton T. Brown, Inc., Bohemia, N.Y. \$2,004,410. Preproduction and production lot sample testing of armament equipment. Naval Air Systems Command. N00019-68-C-0324.
- 12—Raytheon Co., Sudbury, Mass. \$4,805,072. Polaris MK 2 guidance alteration kits and electronic assemblies. Waltham, Mass. Special Projects Office. N00030-68-C-0211.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$456,137,563. Development and production of Poseidon (C-3) missile system. Special Projects Office.
- 13—United Aircraft, Hartford, Conn. \$45,606,445. Product support engineering for TF30, J34, J48, TF33/JT3D, J52, J57/JT3, and J76/JT34 engines. Naval Air Systems Command.
- U.S. Steel, Pittsburgh, Pa. \$13,246,620. MK 82 bomb bodies. McKeesport, Pa. Navy Ships Parts Control Center, McKeesport, Pa.
- Vitro Corp., Silver Spring, Md. \$3,989,995. Fleet ballistic missile program system engineering. Special Projects Office. N00030-68-C-0009.
- Bendix Corp., Mishawaka, Ind. \$1,968,000. Engineering and development of Talos RIM-8 and Talos ARM missiles and associated production, and tactical test equipment. Naval Ordnance Systems Command. N00017-68-C-4302 G8-0622-017.
- Curtiss-Wright Corp., Wood-Ridge, N.J. \$1,486,548. Product support engineering services for J65 engines. Naval Air Systems Command. N00010-68-C-0140.
- Aqua-Chem, Inc., Waukesha, Wis. \$1,360,912. Distilling units, repair parts, engineering services and technical data. Naval Ship Systems Command. N00024-68-C-6291.
- 14—Norfolk Shipbuilding & Dry Dock Corp., Norfolk, Va. \$3,420,000. Conversion of the Auxiliary Repair Drydock, ARD 18, Chesapeake, Va. Naval Ship Systems Command. N00024-68-C-0317.
- Sylvania Electric Products, Waltham, Mass. \$1,003,693. 860-degree antennae. Naval Electronic Systems Command. N00039-68-0626.
- 15—Texas Instruments, Dallas, Tex. \$5,371,061. Shrike missile guidance and control sections with wings and fins. Naval Air Systems Command. N00019-68-C-0069.
- Littion Systems, Van Nuys, Calif. \$3,668,662. Service test digital transmission and switching system. Naval Electronic Systems Command. N00039-68-C-0627.
- General Precision, San Marcos, Calif. \$2,549,626. Design and development of an emitter-receiving system for support of the electronic emitter location system used aboard aircraft. Navy Purchasing Office, Los Angeles, Calif. N00123-67-C-3010.
- Atlas Fabricators, Long Beach, Calif. \$2,250,930. Steel storage boxes for small arms ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5335.
- Reebelen Construction Co., Sacramento, Calif. \$1,175,000. Construction of two run-up shops, a service shop and a storage base for special liquid for the SAC missile facility, Castle AFB, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif.
- United Aircraft, Stratford, Conn. \$1,200,000. Increase of long lead time funding for HH-3F helicopters. Naval Air Systems Command. N00019-67-C-0141.
- Teledyne Systems, El Segundo, Calif. \$1,167,450. Equipment to support the navigational computer system used on A-7A/B aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-4400.
- 18—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$5,961,000. Incremental funding for the EA-6B aircraft program. Naval Air Systems Command. N00019-67-C-0078.
- 19—General Electric, Syracuse, N.Y. \$1,960,668. Radar course directing equipment. Naval Electronic Systems Command. N00039-68-C-0630.
- Sperry Rand Corp., St. Paul, Minn. \$1,343,000. Computers, motor generator sets, and recorder-reproducer equipment. Naval Ship Systems Command. N00024-68-1028.
- Bethlehem Steel, Terminal Island, Calif. \$1,256,227. Conversion of mechanized landing craft to command communication boats. Supervision of Shipbuilding, 11th Naval Dist., Long Beach, Calif. IFB N62791-68-B-0082.
- 20—Swenson Co., Inc., San Jose, Calif. \$6,628,000. Construction of a building addition at the Air Force Satellite Test Center, Sunnyvale, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBY-77718.
- United Aircraft, East Hartford, Conn. \$1,188,518. Spare parts for F-9F aircraft engines. Aviation Supply Office, Philadelphia, Pa. N00383-8-69000A-AF140.
- Stanwick Corp., Washington, D.C. \$1,136,487. Develop and analyze managements information products for Fleet Type Commanders. Arlington, Va. Naval Ship Systems Command. N00024-68-C-5063.
- 21—Electronics Communications, Inc., St. Petersburg, Fla. \$20,769,000. Manufacture of AN/SIC-27 radio sets. Naval Electronic Systems Command. N00039-68-C-1560.
- 22—George A. Fuller Co., Atlanta, Ga. \$3,856,000. Construction of two missile assembly and packaging buildings at the Naval Weapons Station, Charleston, S.C. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. NBY-88730.
- P. D. Rich Co., Stamford, Conn. \$1,453,000. Construction of an aircraft overhaul and repair shop at the Naval Air Station, Quonset Point, R.I. Northeast Div., Naval Facilities Engineering Command, Boston, Mass. NBY-83480.
- H. Koach & Sons, Inc., Corte Madera, Calif. \$1,326,181. Lap belt section of parachutes. Naval Aviation Supply Office, Philadelphia, Pa. N00383-68-C-4123.
- Norge Associates, Sea Cliff, N.Y. \$1,181,890. Construction of barracks at the Naval Construction Battalion Center, Davisville, R.I. Northeast Div., Naval Facilities Engineering Command, Boston, Mass. NBY-83618.
- 25—American Machine & Foundry Co., York, Pa. \$28,004,001. MK 82 bomb bodies. Naval Supply Systems Command. N00104-68-C-0716 P008.
- General Dynamics, Pomona, Calif. \$2,800,000. Teyler/Taitair ordnance alterations. Naval Ordnance Systems Command. N00017-68-C-2108 G8-0622-037.
- Raytheon Co., Portsmouth, R.I. \$1,679,907. Conduct of a submarine integrated systems engineering study. Naval Ship Systems Command. N00024-68-C-1210.
- Kaiser Aerospace & Electronics Corp., Palo Alto, Calif. \$1,226,512. Components of the AN/AVA-1 radar system used on A-6A and EA-6A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-1801-0009.
- Lockheed Aircraft, Plainfield, N.J. \$1,138,150. Design, development and engineering improvement for Gun Fire Control System, MK 88 MOD 0, and related equipment. Metuchen, N.J. N00017-67-C-2308 8-0257-109.
- Bendix Corp., North Hollywood, Calif. \$1,032,881. Redesign of component parts of the MK 46 torpedo guidance and control system. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-1874.
- 26—LTV Aerospace Corp., Dallas, Tex. \$18,093,585. A-7E aircraft. Naval Air Systems Command. N00019-68-C-0075.
- General Dynamics, Pomona, Calif. \$7,100,000. Standard Aim missiles. Naval Air Systems Command. N00019-68-C-0074.
- United Aircraft, Norwalk, Conn. \$3,942,040. Radar spare parts for A-6A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-67-A-5690-0176.
- International Harvester Co., San Diego, Calif. \$3,150,038. Gas turbine generators. Sunnyvale, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. N62474-67-C-0265.
- United Aircraft, Hartford, Conn. \$1,733,613. General design, development and qualification testing of the TF30-P-7 engine, with preproduction ejector assembly kits. N00019-68-C-0440, \$1,533,658. General design and development of the TF30-P-7 engine for the Air Force. N00019-C-0081. Naval Air Systems Command.

- Magnavox Co., Fort Wayne, Ind. \$1,688,285. Classified electronic equipment. Naval Air Systems Command. N00019-68-C-0434.
- Westinghouse Electric, Pittsburgh, Pa. \$1,034,000. Provide training for the support of the technical and operation evaluation program on the MK 48 MOD 0 torpedo weapon system (services). Key Port, Wash. Naval Ordnance Systems Command. N00017-68-C-1214.
- 28—Harvey Aluminum, Inc., Torrance, Calif. \$11,584,178. AM-2 airfield aluminum landing mats and pallet assemblies. Naval Air Engineering Center, Philadelphia, Pa. N00156-68-C-1668.
- Computer Sciences Corp., El Segundo, Calif. \$5,799,885. Computer programs for the Naval Tactical Data System and related items. San Diego, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-01611.
- Raytheon Co., Bedford, Mass. \$10,575,000. Sparrow III guided missiles and adapters. Lowell, Mass., Bedford, Mass., Oxnard, Calif. and Bristol, Tenn. Naval Air Systems Command. N00019-68-C-0386.
- Goodyear Aerospace Corp., Akron, Ohio. \$10,498,000. Eight TA-4F aircraft operational flight trainer, Device 2F00 including data and support. Naval Training Device Center, Orlando, Fla.
- Kaiser Aluminum & Chemical Sales, Inc., Halethorpe, Md. \$5,997,615. AM-2 airfield aluminum landing mats and pallet assemblies. Naval Air Engineering Center, Philadelphia, Pa. N00156-68-C-1669.
- Littion Systems, Inc., New Rochelle, N.Y. \$1,403,471. Three mobile communication centrals. Marine Corps Headquarters.
- 29—Littion Systems, Woodland Hills, Calif. \$7,456,952. Equipment pertaining to inertial navigational systems and computer systems. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-1201-0027.
- North American Aviation, Inc., Columbus, Ohio. \$3,000,000. OV-10A aircraft. Naval Air Systems Command. N00019-68-C-0113.
- Raytheon Co., Lowell, Mass. \$1,964,846. Guidance and control sections for Sidewinder 1C guided missiles. Naval Air Systems Command. N00019-68-C-0164.
- LTV Aerospace Corp., Dallas, Tex. \$1,360,000. A-7E aircraft funding. Naval Air Systems Command. N00019-68-C-0075.
- Collins Radio Co., Richardson, Tex. \$1,242,686. Airborne communication sets and related equipment. Naval Air Systems Command. N00019-67-C-0382.
- General Precision Systems, Inc., Little Falls, N.J. \$1,251,100. Equipment pertaining to the inertial measurement system used in A-7E aircraft. Aviation Supply Office, Philadelphia, Pa. N383-91017A-AA187.



DEPARTMENT OF THE AIR FORCE

- 1—Littion Systems, Ltd., Rexdale, Ontario, Canada. \$3,560,470. Weapons release systems (AN/ASQ-91) applicable to F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- 4—United Aircraft, Windsor Locks, Conn. \$1,232,278. Production of replenishment spare parts in support of C-130 aircraft propellers. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 09603-67-A-0322-0273.
- Wall Colmonoy Corp., San Antonio, Tex. \$1,184,687. High temperature furnace braze repair of jet engine hot section parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Ga. AF 41698-67-D-5863-0005.
- 5—Littion Systems, Ltd., Rexdale, Ontario, Canada. \$1,012,476. Weapons release systems for the F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Air Force Tests "Instant Playback" Continuous View Radar

- United Aircraft of Canada, Ltd., Longueuil, Quebec, Canada. \$3,050,165. R-4360 aircraft engine spare parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
- 6—North American Aviation, Inc., Canoga Park, Calif. \$1,000,000. Production of Thor propulsion systems. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF F04701-67-C-0141
- 7—Batesville Mfg. Co., Batesville, Ark. \$2,233,056. Bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F33657-68-C-0850.
- 8—Dynamics Corp. of America, Bridgeport, Conn. \$1,646,646. Generator sets. Pasco, Wash. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. AF 04006-68-D-0676.
- 12—Lockheed Aircraft, Burbank, Calif. \$1,494,360. Production of flight hood modification kits for C-121 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F 04006-68-A-0067.
- 13—AVCO Corp., Wilmington, Del. \$1,087,500. Re-entry vehicles. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F 41608-68-C-2207.
- Sylvania Electric Products, Waltham, Mass. \$1,000,000. Advanced modulation and computer for future radar application. Rome Air Development Center, Griffiss AFB, N.Y. F 30602-68-C-0283.
- Fairchild Hiller Corp., Farmingdale, N.Y. \$1,041,000. Electronic modification kits for F-105 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F 04006-68-J-0009.
- 18—AVCO Corp., Richmond, Va. \$10,095,800. Production of aircraft ordnance fuzes. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F33657-67-C-0443.
- Textron, Inc., Grants Pass, Ore. \$2,544,200. Production of F-4 aircraft ejector racks. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF F0603-68-C-1485.
- 19—Goodyear Aerospace Corp., Akron, Ohio. \$1,406,643. Production of air cargo handling pallets. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
- Aircraft Hydroforming, Inc., Gardena, Calif. \$1,225,181. Production of aircraft bomb racks. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- 20—General Motors, Indianapolis, Ind. \$5,614,067. Jet turbine modification kits. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34601-67-A-1691.
- United Aircraft, Windsor Locks, Conn. \$2,070,710. Modification kits for bomb rack releases in support of B-52 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 09603-67-A-0322.
- Hughes Aircraft, Culver City, Calif. \$1,825,000. A service test model of an advanced laser reconnaissance set. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0063.
- North American Aviation, Los Angeles, Calif. \$1,200,000. Production of wing modification kits for F-100 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. AF 04006-67-A-1813.
- Chromalloy American Corp., San Antonio, Tex. \$1,175,028. Repair and coating of J57 and J75 compressor blades. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 41608-68-D-1617-0004.
- 21—General Precision Systems, Inc., Pleasantville, N.J. \$1,016,504. Airborne electronic equipment for C-7, C-123 and C-130 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0924.
- 25—Hansel-Phelps Construction Co., Greeley, Colo. \$1,229,000. Construction and modification of strategic missile support base facilities at Minot AFB, N.D. Engineer Ballistic Missile Construction Office, Norton AFB, Calif. DACA 13-68-C-0001.
- 26—Adventure Line Mfg. Co., Parson, Kan. \$6,440,000. Bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0778.

Radar that operates similar to the instant replay technique, now used in football television broadcasts, and gives a continuous view of a geographical area is being tested by the Air Force Systems Command's Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio.

Tests are being conducted out of Holloman AFB, N.M., using a KC-135 aircraft for forward-looking radar systems, and a C-141 aircraft for flight-test of precision navigation equipment.

Purpose of the radar tests is to find the best resolution at different speeds, altitudes and ranges.

The new radar has the capability of operating like a zoom lens, a common technique used by television cameramen to film closeup shots. In addition, the equipment can "freeze" a scene so that the operator can precisely locate a particular area.

On-board computers, tied in with the radar equipment, automatically

guide an aircraft to a particular target area. Information can be fed to the computers before or during flight, and just before an aircraft reaches a specified area, cross hairs automatically align on the target.

A high-resolution photogrammetric camera, which measures objects as small as seven microns or about four-hundred thousandths of an inch, checks to insure that the area being targeted by the radar is the area originally programmed for location by the equipment.

Equipment from Philco and Autonetics is being tested on the KC-135, while tests of precision navigation will evaluate equipment from General Precision, Inc., AC Electronics, and Autonetics on the C-141.

Purpose of the precision navigation tests is to determine which equipment will best enable an aircraft to fly from one location to another, at different and varying rates of speed, and still enable aircraft personnel to determine exactly where they are.

Army Forms New Tactical Communications Office

The mission of assuring compatibility in development and inter-operation of combat communications systems has been assigned to a new Tactical Communications Systems Office at Headquarters, U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.

Brigadier General Paul A. Feyereisen has been selected as Deputy Commanding General for Tactical Systems at ECOM, in addition to his responsibility as U.S. program and project manager for the Mallard Project.

Creation of the command position and a specially selected systems engineering staff is the result of a study report. Recommendations resulting from this study recognized the necessity for comprehensive engineering of communications systems to assure effective interface, and development of all communication means as a single integrated tactical communications system.

The central purpose of the Tactical Communications Systems Office will be to assure "coherence and integrity" of tactical communications system engineering for which the Army Electronics Command is responsible. This will involve developing, coordinating, maintaining and monitoring the implementation of integrated tactical communication systems plans.

The new office will work closely with Army Combat Development Command, particularly its Communications-Electronics Agency at Fort Monmouth whose functions include determining the communication needs of the man in the field.

As its name indicates, the Tactical Communications Systems Office will deal primarily with communications employed directly in combat and field operations. However, the drive for greater compatibility extends to better interfaces between tactical and strategic systems, including global communications networks.

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Air Force Adopts Life-Cycle Tire Procurement

Ogden Air Material Area (OOAMA), Hill AFB, Utah, which is responsible for managing all of the Air Force's aircraft tires and tubes, has adopted a new purchasing philosophy.

No longer do experts at OOAMA's Materiel Management and Procurement and Production Directorates look upon tires bought at the lowest competitive bid as necessarily being the cheapest.

This relatively new technique is called "Life Cycle Costing Procurement of Aircraft Tires."

Under the old procedure, OOAMA bought all its tires based on the lowest unit cost quoted by any of the qualified manufacturers. However, under this method it was found that the Air Force was not getting the best dollar value tire in many cases. For example, a tire which met specifications could be bought for \$53 and might provide 15 landings. Another qualified tire costing \$54 would give 25 landings. Thus to buy the higher priced tire was found to be more economical since cost per landing is reduced. Other costs, such as shipping, storage and maintenance, are also cut proportionately, because fewer tires need be purchased.

Now being fully tested in the field, the new tire-buying concept takes into account such factors as temperature, weather, runway and taxiway surfaces, aircraft weight and pilot techniques. These and other factors are compiled into a landing index which is based on the performance of the tires in actual use. This index is coordinated with the manufacturer for his concurrence.

The next invitation for bid (IFB) on these tires specifies the landing index. The IFB also lists shipping and maintenance costs, also used in the bid evaluation to determine the lowest cost-per-landing tire.

Accompanying the new procurement procedure is a new reporting method. The system provides actual performance data on each tire by size, application and manufacturer. This gives a constant follow-up on tire performance.

Services Agree to Common Electronic Installation Standards

An agreement, designed to bring about coordination among the electronics engineering and installation agencies of the respective Military Departments, has been signed by representatives of the Army, Navy and Air Force.

Tri-Service working groups will be established to seek solutions to problems of mutual concern, to develop common installation standards beneficial to all Military Departments, and to insure that system flexibility is engineered into major systems of common concern.

Each Military Department will be delegated detailed procurement, engineering, and installation responsibilities for its part of each program of mutual interest. The increased coordination is intended to prevent extensive duplication of effort, and improve technical management of the programs.

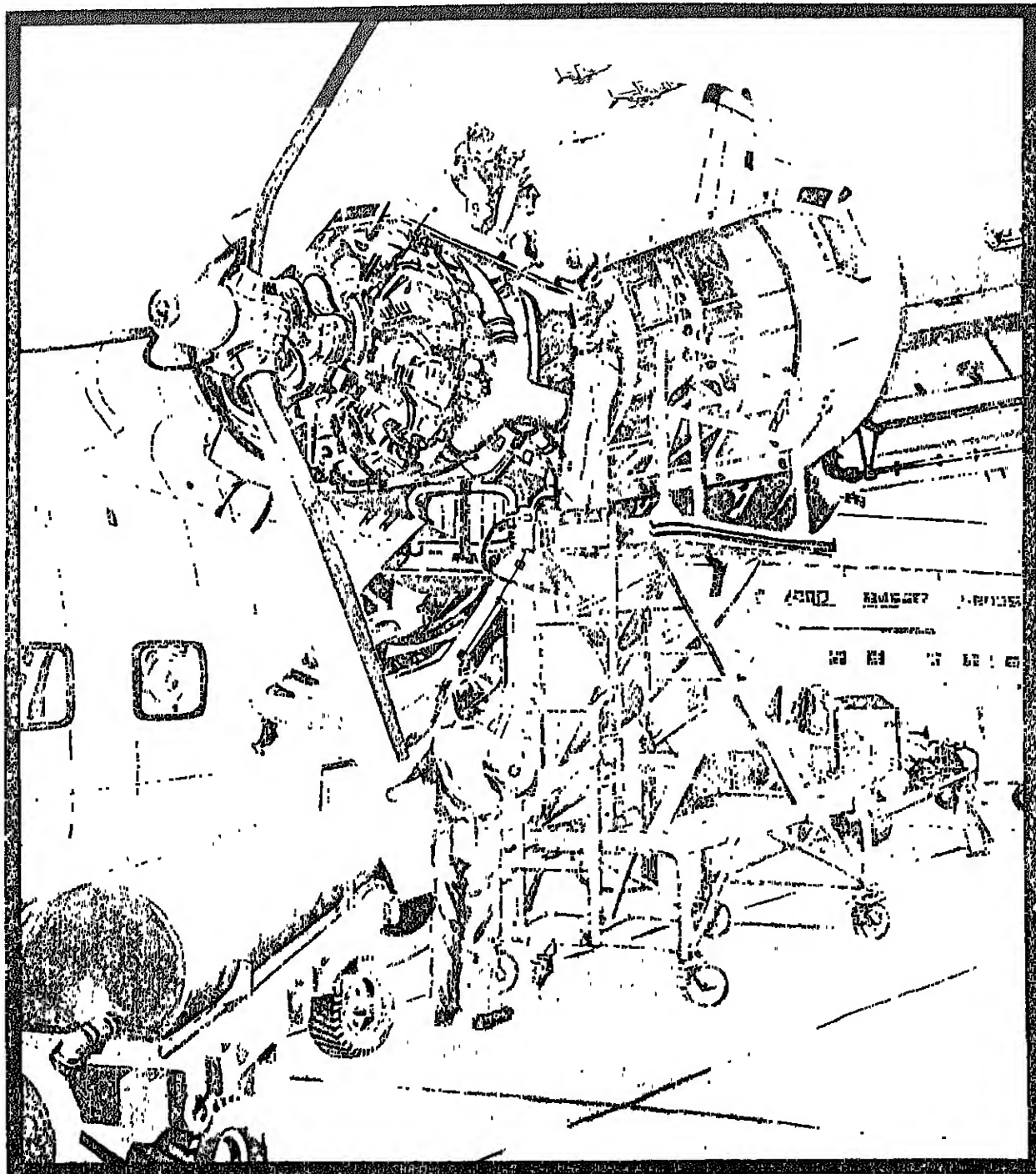
One of the advantages of the team effort is the much more favorable buying position resulting from consolidation of requirements. In effect, combined shopping lists will be prepared for equipment and services needed under the communications-electronics program.



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Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

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Integrated Logistic Support

The Life-Cycle Task of Support Management

Colonel Gerald Holsclaw, USAF
Fred T. Carlson

Integrated logistic support (ILS) is the life-cycle task of support management. It includes responsibility for preserving continuity in the systematic planning, development, acquisition and operation of weapons and equipment in order to maximize readiness and optimize costs. Given the goal of maximizing weapon and equipment readiness at optimum costs, the integration of logistic support elements into complementary time-phased and mission-oriented actions is a management task which today challenges all members of the defense team—military, civilian and contractor alike.

DOD Directive 4100.35, Development of Integrated Logistic Support for Systems and Equipments, describes integrated logistic support as:

"a composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle. . . ."

Management integration of logistic support elements into the systems engineering management process should start at the beginning of concept formulation for a weapon system or piece of equipment. Support management continues through the contract definition, development and production phases of the equipment life cycle. Unlike other elements of systems engineering management which usually terminate with acquisition of the equipment by the using commands, the support management task continues on during operations, with emphasis then on performance instead of planning.

ILS planning can make visible the support requirements essential for improved life-cycle costing and systems analysis trade-offs. It can also provide a sound baseline for achieving lower costs per unit of equipment use under total package procurement concepts. Full development of these

latter techniques requires visibility of events and resource requirements. No matter how sound the concept, or how fine the logistic objective, someone has to "work" the technical support management problems of how, what, when, and where, before answering "how much." No computer program or management magic has yet been designed which can do it for us alone.

Today our weapons establish their own complex and demanding support requirements. Too often we are surprised at them—sometimes even indignant at the drains their unplanned demands make on our limited resources of time, men and materiel. Yet why indeed should the shape and magnitude of these requirements surprise us since we control the design of the weapons and the environment in which they are used?

For a number of years now, many serious students of the developing logistics disciplines have been grappling with these problems, and it may be useful to briefly recount them. Prior to World War II, our weapons and equipment were relatively simple. Interest in hardware support invariably followed after interest in design and production. With the advent of war, widening of the electronic spectrum to include radar increased skill requirements and crossed conventional skill boundaries into other increasingly sophisticated mechanical systems. This, of course, pyramided training and technical data requirements.

The natural reaction to these complex subsystems was to increase specialization. By the time of the Korean conflict we were talking "weapon systems" but still using the old methods of procurement first, later followed by consideration of support. Specialists performed alone within their functional support areas, and feedback to design was nonexistent or, at best, haphazard. Support deficiencies defined support

requirements. Frequently nothing fit. Handbooks and training characteristically lagged equipment changes. Program approvals and fund approvals were frequently contradictory. Late production and cost overruns reflected reaction to, rather than planning for, logistics requirements. We were truly "pound foolish and penny wise" in forcing support to absorb many program cuts.

Long before the DOD directive on integrated logistic support was published, the need to better identify and control equipment support requirements had attracted the attention of managers, engineers and technicians both in the military and within industry. Until then, the principal efforts to influence support through requirements on design were being developed within the disciplines of maintainability and reliability.

Published on June 19, 1964, DOD Directive 4100.35 first defined the concepts and objectives of integrated logistic support. Today, this directive remains as perhaps the earliest expression of nearly identical goals, newly and effectively expressed in terms of life-cycle costing and single package procurement.

After publication of the directive, an ad hoc committee, with DOD, Service and industry representation, met under the auspices of the DOD Equipment Maintenance and Readiness Council to produce ". . . a package of selected, integrated management tools to assist logisticians . . . to participate actively and efficiently in the life cycle of system and equipment projects."¹ A series of nine tasks were assigned to nine subcommittees. Much valuable work ensued, exploring the implications and problems of integrated logistic support. Many recommendations and conclusions were reached and reported upon

¹ "Report of DOD Directive 4100.35/Ad Hoc Committee," Volume I, page 6

in a series of committee reports. In addition to identifying problems for further study, perhaps the biggest contribution made by these exhaustive study efforts was their value in indoctrinating both study participants and observers in a much wider appreciation of the opportunities for improved equipment readiness and reduced operational support costs available through the integrated management of logistic support elements.

The latest aid to the implementation of DOD Directive 4100.35 is the proposed "DOD Systems and Equipment Integrated Logistic Support Planning Guide." It has been reviewed in draft form by industry and the Military Services and should be published by fall.² The guide is the result of effort by a joint DOD working group and the Logistics Management Institute, a non-profit research group under exclusive contract to the Defense Department.

Why do we need a guide? This guide is needed because conflicts within the logistics disciplines themselves often are settled for the lowest apparent cost, without consideration of the future effects on equipment availability or support costs. With notable exceptions in each Service, development plans usually ignore or scatter logistic requirements. We react to, rather than plan for, support requirements. The results are cost overruns and program delays.

It would be wrong to imply that the ILS guide contains much that is new. It does, however, bring together for the first time many valuable techniques and management procedures which have been tried and proven in a variety of circumstances within the Services and industry. The scope, content and format of the guide were shaped by requirements developed one-by-one during joint working group and editorial sessions.

²The draft *DOD Systems and Equipment Integrated Logistic Support Planning Guide* is available from the Defense Documentation Center (DDC), without charge, to authorized organizations with DDC user numbers. Others may obtain it from the Clearinghouse for Federal and Scientific Information, Department of Commerce, Springfield, Va. 22151, at a cost of \$3 each (microfiche 65 cents). Document number is AD 663 456.

Chapter 1 provides an overview of the purpose, application and contents of the guide. Chapter 2 describes the system design and support management relationships necessary to the proper planning of logistic support. Chapters 3 through 12 describe the life cycle program events for the selected support elements. Fold-ins at the end of each chapter illustrate the required interface between each support element and design management, and support management. These chapters also portray each element's relationship to design, production, test and operations. In its entirety, the guide provides a "kit of tools" for use by program managers, designers and logisticians. It is intended as an aid to assist them in tailoring or critiquing logistics plans and actions in support of equipment readiness.

The guide does this by providing a "road map" of typical logistic actions to be accomplished during the life cycle of a typical equipment program. It is not an inflexible plan. It is intended as a tool for use by project managers in tailoring their own program milestones to fit their own peculiar development requirements, as modified by the degree of system complexity, procurement methods, etc.

The guide addresses functional, rather than organizational requirements. Event sequences are charted to reflect functional relationships rather than existing organizations. The guide's basic procedures are workable today within the framework of existing policies, if project managers and contractors choose to negotiate them into the contracts.

The initial working group task was to revalidate the support elements defined in DOD Directive 4100.35, and describe their interactions by charting sequential support tasks. All elements were revalidated except "Contract Maintenance." While the group recognized the importance of contract maintenance, it was considered a "method" rather than an "element" of logistic support. For example, it is clear that in some cases contracting might be properly employed in support of any or all the logistic elements, and not just maintenance alone.

The engineering disciplines of maintainability and reliability were added as elements from the standpoint of their maintenance preventiva-

tive roles. These disciplines are also needed to perform trade-offs between support elements, and provide key characteristic inputs from support management to design. It is recognized that they must also remain as functions of design to perform engineering apportionment of performance goals to subsystems and components.

The working group was unanimous in seeing the need to add a "Funding" element to provide fiscal plans in support of technical program approvals. "Technical Logistics Data" was another matter. Much confusion stems from lumping technical hardware descriptions and related instructional or procedural manuals with periodic or transient performance and failure data. Although technical in nature, these latter data measure the results of organizationally combined equipment and people of various skills in various mission environments. While common hardware coding identification should be maintained, the differentiation of these two elements of data as "technical" (for hardware descriptions and procedures) and "management" (for evaluation of equipment and organizational support capabilities) is considered essential.

The last element to be added was "Transportation and Handling." While this could be considered a part of the supply support function, parts and equipment damages, delays and losses are frequently beyond its control. The facts are that everyone who handles hardware has a big responsibility here. It is a responsibility which needs closer consideration by both design and support management at every echelon.

The 10 interrelated elements of logistic support revalidated by the joint working group and identified as requiring project-type management are:

- Maintainability and Reliability (MR).
- Maintenance Planning (MP).
- Support and Test Equipment (SE).
- Supply Support (SS).
- Transportation and Handling (TH).
- Technical Data (TD).
- Facilities (FA).
- Personnel and Training (PT).
- Funding (F).
- Management Data (MD).

The ILS guide places these elements in perspective with both mission objectives and such varied functional management disciplines and techniques as procurement policies, life-cycle costing, configuration management, value engineering, quality assurance, and resource management. It also covers the functional relationships between overall program management responsibilities for system design, support, production, and project administration and control (Figure 1).

The support management function integrates the element activities and meshes support requirements with system design requirements. Support management must be recognized as a function of overall project management.

Planning Integrated Logistic Support

The integration of support management can be visualized in two dimensions of reference:

- Horizontally, support management responsibilities can be thought of as spanning the time from concept formulation through operational employment, paralleling and supporting the design functions during acquisition.
- Vertically, each of the logistic support elements must then also be tied together by support management which has responsibility for coor-

dnating the interface of support with system design at each action sequence on the horizontal time line.

Consideration must be given not only to timing, interface and completeness of all support actions, but also to each support element's relationship to the other project functions and disciplines within the whole spectrum of systems engineering management.

The remainder of this article will provide an overview of ILS management events, as described in the guide, applying to an average program life cycle, and to the interrelationships among the selected ILS elements as their events take place during the same life cycle.

Logistic support planning requires a dynamic working relationship between system design and support management. It involves repeated review and refinement of emerging support requirements and their probable impact on design objectives, including operational and readiness performance characteristics for the use environment. Quantified operational readiness performance specifications (in the form of maintainability and reliability characteristics and projected support requirements) thus become a yardstick against which design and support can be defined in terms of assigned tasks and needs, and evaluated in terms of

finite measurements. These specifications, or key characteristics, may be expressed in terms of "numbers," measuring gross system availability, utilization, downtime, turnaround, crew requirements, maintenance man-hours per operating hour, and defined constraints on supporting resource requirements, as appropriate to the equipment type and intended use.

ILS planning includes the elimination of support requirements, whenever practical, and reduction of remaining support costs to the optimum level consistent with operational readiness requirements. Results will not come about by routine observation of support needs. Their attainment requires the systematic evaluation of all design/support characteristics by qualified engineers and support technicians. This involves continuous assessment of the probable impact developing design will have on specific performance and support requirements.

Support management must assure that its task force specialists responsible for the various support elements:

- Understand the mission system and equipment.
- Define actions and resources required for complete life-cycle support.
- Schedule actions and commit resources to support development and future operations.
- Request and utilize funds in a preplanned sequence to preclude cost overruns and unnecessary program delays.
- Use performance and management data and standard staff control techniques to maintain an information and experience exchange between program elements.

Concept Formulation Phase

The system or equipment life cycle begins with the identification of an operational deficiency or the need for a new military capability. (See block SD-1 in fold-in chart in center spread in this issue. This chart will be convenient in tracing all subsequently referenced action blocks. This required operational capability (SD-1) is usually defined by the nature of the threat, the anticipated operating environment, variations in basic mission, and the constraints of policy, funding, gross schedule requirements, and mini-

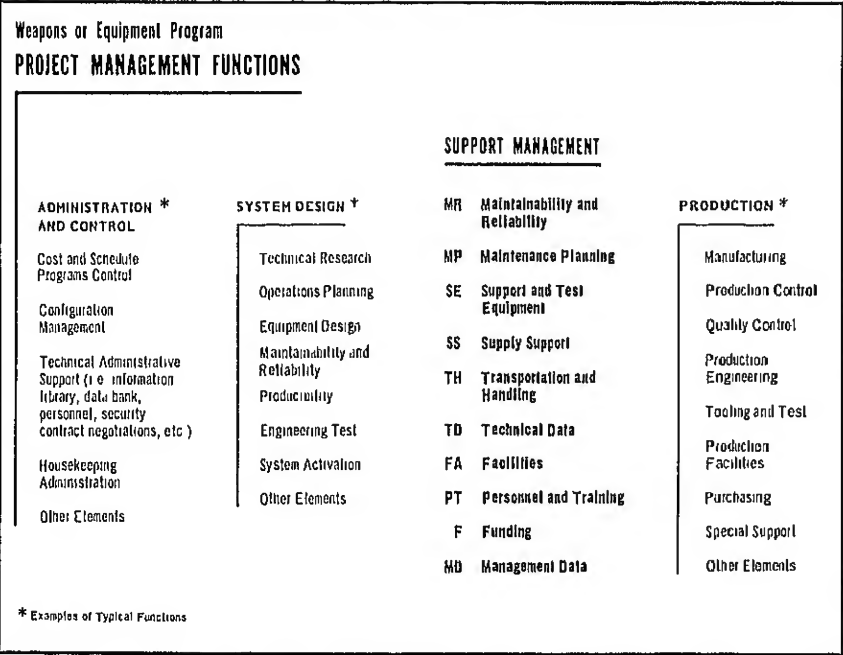


Figure 1.

mum system operational performance criteria (e.g., speed, range, capacity, firepower, target acquisition, vulnerability, etc.). These needs may result in tentative requirements for aircraft carriers, logistics ships, aircraft, missiles, radar nets, communications systems, special combat vehicles, or multiple combinations of such systems or equipment.

The logistic support manager and his initial cadre of support representatives must analyze the required operational capability to determine the logistic support capability needed (SM-1). These support capabilities will be stated in terms of:

- Quantitative readiness performance criteria (e.g., system availability, utilization, permissible scheduled and unscheduled maintenance downtimes, operator and maintenance requirements in terms of gross skills and manning levels, firing rates, launch rates, etc.).

- Qualitative readiness requirements (e.g., compatibility with existing replenishment techniques, operational unit self-sufficiency in remote areas, personnel skill level limitations, automated fault isolation techniques, etc.).

The criteria for a missile system may be in terms of a 96-percent uptime availability including scheduled and unscheduled maintenance, 0.7 maintenance man-hours per ground operating hour, remote locations and distances, proximity to support facility, etc. The criteria for a ground transport vehicle may specify 37 total maintenance man-hours per 10,000 miles, anticipated operating hours per month, support self-sufficiency aboard the vehicle (tools, spares, etc.). Where experience does not suggest improvement quantitative goals to shoot for, the criteria will spell out the need for study determination of optimum support performance and cost goals tailored to the type of system needed.

The logistic support manager and his support specialists provide support considerations to the required operational capability document (SD-2) by identifying the needed support capability, proposing modifications to the operational requirements statement which will enhance overall effectiveness, and recommend-

ing substitute capabilities or alternate solutions.

The estimate of the current logistic support capabilities (SM-2) consists of an integrated package of each support element's forecast ability to satisfy support readiness requirements defined in the logistic support capability. The information developed by maintainability and reliability, maintenance planning, supply support and the other elements must be analyzed and properly integrated by support management. The results are reflected in the operational capability document (SD-2). For example, the estimates would include readiness performance experience together with lessons learned on previous similar systems. Government in-house and study contract responsibilities should be defined for the development of concepts which satisfy those requirements not covered by current capabilities. All of the information up to this point should be part of the required operational capability document (SD-2). Review and approval of this document provides information to the contractor and in-house for studies necessary to develop system concepts, technical approaches to equipment, and preliminary cost and schedule information. Contracts should clearly delineate responsibilities for development of requirements, schedules,

costs, etc., for the subsequent concept study effort.

Based upon the approved operational capability document and implementing studies, several preliminary system and equipment ideas are developed to explore alternate ways of achieving mission objectives. System/cost/effectiveness trade-offs determine the optimum choice among the several system and equipment concepts. Logistic support requirements defined during these feasibility studies (SM-3) permit comparison between various life-cycle support cost alternatives. The concepts might cover alternative ways of recovering boosters from the sea, firing of missiles by sabot versus their own power, alternative access routes to underground equipment, or maintenance and supply at remote sites versus home base. These studies may be summarized for program management review and must record selection rationale behind each considered concept. They include mission analyses trade-offs involving system and support selection, development cost and schedule estimates, life-cycle cost estimates, and preliminary performance specifications.

The system concept formulation package (SM-4A) assures higher authority that the selected system and support concepts are the best way to satisfy the identified operational need, and recommends the

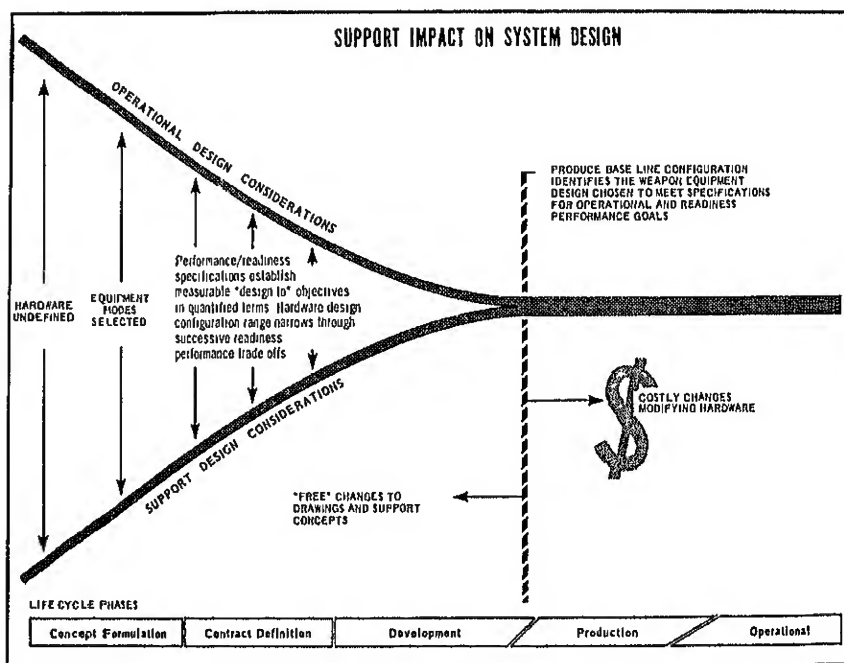


Figure 2.

resources needed to pursue further development. The package contains a description of the proposed system and support concept (SM-4B), the costs and schedules, and the rationale supporting the concepts selection. It provides for a preliminary program review prior to preparing a system development plan. A Program Change Request (SD-4A and SM 4-A) is prepared to incorporate the selected program into the DOD Five-Year Defense Program. DOD approval is granted by a Program Change Decision.

Support plan requirements (SM-5) are developed for inclusion as a logistics section of the system development plan (SD-5). These requirements include gross support functions that meet system or equipment requirements, the design and support goals and criteria in terms of readiness and cost to be met during engineering development, support trade-off criteria to be considered, and support program management activities and decision points anticipated during subsequent development events. Specific inputs to the support plan requirements include maintainability and reliability goals, maintenance concepts, preliminary support equipment estimates and design criteria, and preliminary supply, facility, personnel and training, funding, technical data, transportation and handling, life-cycle cost and support schedule requirements.

The systems development plan becomes the functional baseline for further engineering development of performance specifications for the concepts selected during the feasibility studies. Acceptance of the development plan is a "key approval action" requiring review and approval prior to contract award and funding release by Service level or Office of the Secretary of Defense authority (as appropriate under existing policy on weapons technology and dollar thresholds). Program reviews leading to this key approval action must insure adequacy of planning for the logistic support of operational maintenance activities. They must be conducted with participation by logistics staff members at the appropriate Service or DOD decision level.

Contract Definition Phase

Before we go on to the contract definition phase, let's go back and review our accomplishments thus far. Although the block sequence traced here is relatively simple, it should be understood that for some complex programs, there may have been several iterations of these previous steps. Decisions should have been reached on questions regarding total or partial package procurements of the system and support resources. What exploratory development has been or is necessary to provide a system which will satisfy the projected readiness requirements? Are the engines and test equipment already in the inventory adequate or must separate interim and long-range programs be planned for their development? How do they tie-in with existing commodity procurements? When can fixed requirements be stated? What are the management relationships that must be considered for the remaining life-cycle phases? What cadre of support personnel should be utilized for subsequent planning? Are maintenance personnel from the operating commands available to help? These questions must be answered before proceeding with the definition phase effort.

Following approval of the development plan, a directive initiating sole source or competitive contract definition for the selected system and support concepts is issued (SD-6A). Included are procurement and budget authorizations. Support requirements (SD-6B), approved as an integral part of system contract definition, are the basis for preparing the logistic support management plan (SM-7A). This plan is to be a management tool for both government and contractor use as appropriate. It defines the specific organizational responsibilities and functions for further development and acquisition of the support resources and monitoring of the contractor efforts. The plan must identify such things as support development program implementation procedures, contractor monitoring policy, maintenance engineering practices to be used, development and acquisition of equipment, procurement and distribution of supplies, funding approach, and other similar management criteria. It includes relationships and responsibilities between development and support commands and

firm designation of the logistic support manager.

Effort during the contract definition phase is aimed toward preparation and approval of an "allocation" baseline for the award of development contracts. From this point on, the article will overview most of the events portrayed in the guide, highlighting the design and support management interactions which are critical to logistic support planning. Here again, definition phase effort may be broken down into subphase activities and successive iterations through competitive contractor participation. A source selection authority is established (SD-7A) to provide DOD in-house evaluation of the several competitive proposals. Representative staff elements from the Services provide assistance in these evaluations. The logistic support manager's representatives on the source selection board establish criteria (SM-7B) for evaluation of proposed support plans. These criteria include policies for determining how well each proposal meets readiness performance specifications and cost requirements, take advantage of current resources, minimize technological risks, and consider life-cycle costs for support.

The request for proposal (SD-7C) is prepared for issuance to competing contractors. It contains results of prior studies and the current system specifications. Included are such key characteristics as readiness performance targets, with criteria for their further development, test and demonstrations. Required program management criteria include assignment of responsibilities, and *selective identification of specific portions* of general directives, policies, and procedure guides that are to apply to this procurement. It is of utmost importance that these criteria thoroughly define operational and readiness performance specification goals, and the support management approach to further development and acquisition of support resources. Where appropriate, requirements for life-cycle cost estimates should be defined in final requests for proposals. Program management must consider and define representative cost elements, time elements, and the simplest appropriate methodology to be followed by competing contractors in developing and updating life-cycle cost estimates for program funding and budget con-

trol, and cost of use (and ownership) comparisons. In simple equipment procurements, product use guarantees alone might satisfy these requirements. Similarly, where the contracts include contractor assumption of support responsibilities and associated costs, major life-cycle cost elements may be already included in the cost of acquisition.

Upon receipt of the system and equipment proposals, the source evaluation board reviews and scores each proposal based upon the previously established criteria (SD-8). These evaluations assess the technical soundness of the proposal in meeting performance requirements, degree of identified risk, contractor fulfillment of tasks in the proposal work statements and his ability to accomplish them, best features of each proposal's design approach, costs and schedules, and comparative impact of proprietary rights.

Improved specifications and more definitive terms may be incorporated into the final development contract as a result of negotiations. The updated system development plan (SD-9A) must now include procurement specifications and detailed demonstration methodology; equipment and support element resource requirements, including government-furnished items; cost and price estimates; and any special contract clauses. Review of the updated development plan is prerequisite to key approval action by the designated project approval authority. This review endorses the plan as an allocation baseline for the development contract awards. Approval of the support portion of the updated development plan is a part of the key approval action specified in event SD-9A. Based upon this approval and upon selection of the contractors, development phase contracts are awarded.

Throughout the development phase, system engineering, including maintenance engineering and other logistic support analyses, will be conducted to further define the detailed equipment specifications and support requirements. Detailed design will be completed. Support management should monitor and integrate all activities necessary to develop the resources, evaluate and approve the specifications and designs, and assure that all design/support changes are thoroughly re-

viewed and evaluated as they occur by all applicable support elements. Preliminary support resources and procedures demonstrations and evaluations should be conducted in consonance with planned system and subsystem demonstrations. These efforts should completely update and validate the support plan as an integral part of the contractor's proposed product baseline, upon which initial production contracts for equipment and support resources can be awarded.

Production of initial units is primarily for limited service and operational tests. First article evaluations and acceptance of the specifications to the as-built hardware then establishes those specifications as a well defined product baseline for key approval of the total configuration and funds release for production runs.

Production and Operational Test Phase

As we enter the full production phase and aim toward the equipping of operating units, user Service tests are conducted at a test facility in a simulated operational environment. Systematic programming and accomplishment of previous system and support events should provide equipment and support resources which will pass these tests with minimum required changes. Systems, equipment and support changes, which do result from these tests, are reviewed by the user and developer and incorporated into follow-on production planning by engineering change proposals. Test results include limited performance experience, technical data validation, support and test equipment performance experience, equipment operator evaluation, and servicing and maintenance experience. Satisfactory completion of the Service tests provides program management with the confidence necessary to continue production and acceptance of hardware in those quantities required for initial deployment to operational units.

Prior to equipping the first operational organization, availability of all system and support resources according to planned schedules is verified. System/support commands, contractors, and using commands review and evaluate shortages, schedule problems, priorities, delivery plans, inventory distribution, and

any other applicable material management considerations for possible correction. Coordination between the operational and system/support commands is necessary to insure complete planning for operations and support. Time-phased activity schedules include the exact need dates and phase-over actions required to furnish equipment, spares and repair parts, technical data, personnel, and other system and support resources to the operating units.

Subsequent to user tests and during equipping of the first operational organization, the logistic support plan is updated to reflect operational support changes to responsibilities, policies, controls, coordination, communications, schedules, etc. The updated plan is used for equipping and supporting subsequent operational organizations. The plan is the basis for staff actions in all required support areas at successively higher levels of management within DOD.

Equipping the first organization can vary from the complex installation and checkout of a missile system to the delivery of a test box. Installation and checkout includes receipt and acceptance of equipment and support resources, assembly, installation, test, integrated system checkout, and verification of the system and support resource performance as installed. Compatibility of all interfaces is verified.

The operational suitability test consists of a predefined demonstration of a full complement of equipment conducted by a typical user organization such as a ship, squadron, company, or regiment during routine training operations for a specified time period.

The demonstration objective is to verify achievement of operational requirements (including readiness performance) through mission accomplishment in a defined environment with measured manpower skills and established equipment and facilities support. The value of the demonstration will be in direct ratio to the realism with which test ground rules were negotiated for personnel selection, based on available skills and average manning levels, spare parts provisioning, test mission profile mix, special test data requirements, etc. Management evaluation and control of such an operational test should be directed toward containing the test within these established rules and

objectives. Care should be taken to avoid interference with the detailed operations and maintenance management of the test unit. As part of this demonstration, detailed support evaluations should include verification of personnel skill levels, adequacy of technical data, availability of spares and repair parts, adequacy of facilities, capability of support equipment, adequacy of data collection and distribution plans, and assessment of the overall support system capability to meet its readiness requirements.

Support planning for these demonstrations and evaluations can be very critical where more than one program is involved, or where responsibilities may be split between more than one support command and/or contractor. If, for example, this planning for an air-to-ground missile is such that it does not lay down the specific technical and management requirements in the early development plan way back in SD-5, the specifications and resources for the missile and aircraft surely will not interface and a very substantial change action will occur.

Modification Cycles Will Occur

Earlier in this article, the need for making changes to the equipment and support resources prior to the product baseline was emphasized. We must face the "real world" and recognize that other modification cycles will still occur (SD-22 through 25). They may be initiated by any one of several situations such as:

- Inability of the system or equipment to satisfy its current requirements.
- Changes in mission operational and support roles.
- Correction of discrepancies where the forecast operational and support goals were unrealistic or inaccurate.
- Equipment failures caused by improper design or fabrication.

In all cases deficiencies are identified and evaluated. Trade-off studies are performed to determine the effect of these deficiencies upon future operations and support. Alternate approaches for modifying the system and support resources and procedures are developed. These alternatives incorporate the best of the field experience recommendations as well as innovations created by advances in technology. Emphasis is placed

upon the correction of the deficiencies by procedural or simple work-around changes.

Support management must assure that each of the support element specialists evaluate the impact of any proposed changes to the plan. The combined results of these evaluations are weighed. If a change is required, all resulting support requirement changes are included in the proposed modification package. Configuration control board action, approving the modification package, must be in accord with procedures implementing current configuration management directives and instructions. These procedures, directives and instructions also establish levels of approval authority. As at previous key approval points, review and approval action, at the appropriate decision level, must include logistics staff participation to insure adequacy of planning for the logistic support of operational maintenance activities.

Where major system or equipment changes are required, a new production cycle (SD-16 and on) for follow-on operational units is initiated against the new configuration baseline. In such a case, aforementioned modification studies involve planning sequences and actions which are equivalent to the definition and development phase tasks leading to a normal product baseline. The detail for each required action in this testing and analysis sequence may be reduced as appropriate to the modification requirements.

To assure mission success within the time constraints imposed by some operational requirements and to satisfy safety, performance, economic, or other factors, it is often necessary to retrofit existing equipment. In this case change packages are prepared which specify the change requirements, responsibilities, schedules and funding by which the military organizations or selected contractors are to perform the required modifications. These changes are accomplished at field, depot and contractor facilities as designated by the appropriate system/support authority.

Operational Unit Analyses

After satisfactory completion of operational suitability testing, follow-on operating units are equipped. Operational commands direct mission assignments of subordinate organiza-

tions and monitor their support performance. Local operating unit analysis of "failure data" (summarizing maintenance actions), along with performance data on mission accomplishment and support responsiveness, will permit unit commanders to separate true hardware deficiencies from those of manning, skills, supply response, organizational management, etc. This evaluated data should be summarized for transmittal to operational commands. Corrective action beyond the capability of unit commanders becomes a requirement for higher command action. Subsequent command analysis involves comparisons between operating units: mission performance, maintenance effectiveness, supply responsiveness, and hardware failure trends. Unit performance for all the above parameters can be weighed against command averages and trends.

Concurrent with operational command management analyses, the system support command will receive raw hardware failure and support data for analysis by the project system support manager (and/or commodity manager). The results of these analyses will be used to update support planning for further procurements, repair and modification. They also provide experience information to project managers engaged in the planning of new systems and equipment.

Reallocation or disposal of operational and support resources is based upon consideration of changes to the required operational capability, technological obsolescence, operations and maintenance costs, and the acquisition of new equipment into the inventory. Integrated logistic support planning for future equipment development should include data from operations and support experience as an aid to management.

Maintenance Planning

Up to this point, the article has covered the integrated logistic support management events from the "gleam in your eye" to the "here-after". They are the "road map" for better understanding and planning of future support programs.

Next to be considered will be the elements of integrated logistic planning—the vertical plane of reference—which compose the events of the life cycle (see fold-in).

A sample element, Maintenance Planning, is a necessary part of support management in that it has functions to be performed throughout the life cycle, and its products become the requirements baseline for all other elements and the actual execution of maintenance during the operational phase. It has the same life-cycle objectives and goals as any other element of program management. It must interface with other program management functions and use the same policies, disciplines and procedures if it is to be properly controlled and be one of the family. Maintenance planning has definite interface responsibilities with the other support elements. Each support element has this same relationship. Each element is an integral piece of the program gear train. If it is inactive in its role, everything stops for a time—except cost.

As shown in the fold-in, the actions to be performed by all support elements during just the concept formulation and contract definition phase are many. Many people—designers, production men, systems engineers and even logisticians—say, "There isn't very much that logistic support personnel can do in the early phases until we know what the hardware is going to be." "Why talk about support techniques unless you can describe how, when, where and to what degree it is to be used on your program?"

Starting from the top down, both Maintainability and Reliability (MR) are included as maintenance preventive characteristics in equipment design and support resources requirements. Maintainability and reliability goals must be incorporated into the equipment and support system design through specifications. The specification requirements must be stated early in the concept formulation phase. Since their characteristics have a direct influence on operational readiness, they collectively express the optimum end result of equipment readiness performance and cost-effectiveness trade-offs. Some people have said this is a design problem only. What about the time when resources are needed, the conceived point of supply, and the quantities as they apply to trade-offs?

Surveillance over changes in both design and support is required to prevent degradation of maintain-

ability and reliability. Demonstrations with the equipment must be conducted to see that requirements are met. The demonstration results are analyzed and trade-offs conducted to improve system design and support. These early trade-offs result in a continual narrowing down of configuration ideas until a firm production baseline is established. Because paper and prototype changes are relatively inexpensive, maximum emphasis must be placed on maintainability and reliability prior to establishing this baseline.

Maintenance Planning (MP) establishes concepts and requirements for each level of equipment maintenance to be performed during its useful life. As such, maintenance planning defines the corrective actions and supporting requirements necessary to maintain the designed system and equipment in its prescribed state of operations. Maintenance functions include checkout, servicing, crew augmentation, status monitoring, inspection, fault isolation, replacement, modification and overhaul. The degree to which these various functions are to be performed by organizational, intermediate, or depot level maintenance must be spelled out. The maintenance plan responds first to readiness requirements and next to economies in the commitment of supporting resources.

Maintenance planning evaluates current and projected maintenance capabilities, and translates them into requirements which can be responded to by the contractor. Initially, the capabilities are stated as concepts and philosophies which become defined specifications as system design progresses. Specific maintenance actions, to be performed at various levels of maintenance and the resource requirements needed to support those actions, are identified by systematic and detailed maintenance engineering analysis. This analysis is conducted concurrently with hardware design and repeatedly updated as design changes. Maintenance engineering analysis documentation provides:

- The identification and description of tools and test equipment, facilities, personnel, spares and repair parts, and technical data.
- Quantification of maintenance support needs by time and place.
- Personnel requirements analysis by skill, type and number.

• Facilities loading to establish adequacy and utilization.

The maintenance planning and analysis effort are tailored in depth to the complexity of the hardware and the program detail required.

The purpose of the support and test equipment program is to assure that the required support and test equipment is available to the operating forces and supporting maintenance activities in a timely manner. The ability to perform required unscheduled and scheduled maintenance depends on the adequacy of the support and test equipment, identified or developed concurrently with the prime system equipment. Support and test equipment consists of tools, monitoring and checkout equipment, maintenance stands and handling devices which are categorized into special (peculiar to the system under development) and common (commercially available or currently in the inventory of the requiring agency).

Supply Inventory Management

Maintaining operational readiness under diverse conditions of military use depends directly on the availability of the right supplies at the time and place they are needed. Sup-



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ply Support (SS) is an essential element of the logistic integration effort and is responsible for the timely provisioning, distribution and inventory replenishment of spares, repair parts, and special supplies.

Supply planning for spares and repair parts must be based upon technical inputs from maintenance planners and engineers (*e.g.*, system/equipment utilization rate, operating hours, failure rates, required field repair rates, locations, and selected maintenance items critical to safety and mission accomplishment). Considered are such supply inventory management factors as the agency responsible for support, the planned management method (*e.g.*, item control by project manager, inventory manager, or gross commodity class), item criticality, item priorities, distribution, repair cycles, attrition rate, and replacement lead time. This process requires support management attention through all phases of the equipment life cycle. Inventory management control depends upon current and complete knowledge of item status by configuration and location so that support management decisions can be made on a responsive basis.

The Transportation and Handling (TH) element provides for the char-



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acteristics, actions and requirements necessary to insure proper transportability, packaging and preservation of all equipment and support items. The functional requirements and actions are developed from operations and maintenance analyses, equipment design drawings, specifications and other documentation defining transportability criteria, handling equipment and procedures, and packaging and preservation needs. Requirements to be considered include:

- Transportability criteria such as time, locations, duration, frequency, volume, security and stock limits.
- Desired locations for transportation equipment and facilities.
- Planned availability of existing system capabilities by quantity, volume and location.
- Additional or special transportation and handling procurement requirements.
- Interfaces with other system design and support management functions.

Technical Data Planning

The purpose of the Technical Data (TD) program is to provide for the timely development and distribution of technical data necessary to conduct operations, maintenance, supply, modification, repair and overhaul of the system and equipment. Technical data provides the link between personnel and equipment. It includes drawings, operating and maintenance instructions, provisioning information, specifications, inspection and test procedures, instruction cards and equipment placards, special purpose computer programs, and other forms of audio/visual presentation required to guide people performing operations and support tasks.

Technical data planning must be based upon inputs from equipment operations and maintenance planners (*e.g.*, system/equipment use, design characteristics, operations and maintenance methods and personnel tasks, frequency and time to repair, supply provisioning and inventory items and procedures, etc.). Technical data considerations are involved in design and support trade-offs, tests, demonstrations, production, operations and maintenance. It is just as mission critical to prepare the wrong kind of data as it is to forget a maintenance task or not have a ready spare. If you

have 15 minutes to perform a maintenance task and it takes 12 minutes to do the actual maintenance and 7 minutes to get to the manual paragraph, you have aborted the mission. Your instructions should have been on the equipment or in the computer which is guiding you through the test or operation.

Facilities Program Planning

The purpose of the Facilities (FA) program is to assure that required facilities are available to the operating forces and supporting activities when needed. The ability to perform the mission could depend on the adequacy of facilities provided concurrently with the prime system or equipment.

Facilities planning is based on operations and maintenance analyses, equipment design drawings, specifications and other documentation necessary for defining types of facilities, locations, space needs, environment, duration and frequency of use, personnel interfaces, installation activities, test functions and existing facility applications. Development schedules must consider construction delay experience on similar programs due to seasonal weather and other regional considerations, such as labor, soil conditions, etc. Facilities planning requires support management attention through all phases of the life cycle to provide positive coordination with other program elements and with system design.

One of the most important interfaces is that between facilities and funding. Long construction lead time, seasonal delays due to weather, and the necessity to plan early when the specifications for other resources are not yet firm, sometimes makes facilities planning a sporting course. It also makes the justification of funds for support facilities very difficult.

Personnel and Training Requirements

Personnel and Training (PT) must establish the requirements for trained operations and maintenance personnel needed to support the system and equipment through all life-cycle phases. A realistic estimate of current manning capabilities, in terms of both numbers and skills, must be made against the probable quantitative and qualitative manning demands of the system or equipment

support concepts under study. As hardware concepts are developed, design and support decisions must be made with due consideration for their impact on manpower and training requirements. These requirements are translated into specific manning plans in terms of numbers and military skill classifications. Projections of training requirements must reflect attrition experience. Special requirements for trainers and training aids must be developed along with training curricula. These requirements must complement maintenance concepts and technical data methods.

Personnel and training planners must progressively identify manning requirements for test and demonstration, operations and maintenance in the use environment. They must consider task categories and resulting optimum skill mixes needed to achieve or exceed readiness performance goals. Personnel requirements for operations and maintenance must be balanced against manpower availability. All deficits must be covered by firm training actions and timely manpower commitments.

Interface Between Support Needs and Funding

Successful ILS planning during all phases of the equipment life cycle requires management attention to the interface between the support element needs and defense budgeting and financing procedures—Funding (F). Because of their importance to implementing logistic support, funding activities are included as a prime element of support management. These activities should include the:

- Early determination of logistic support funding requirements which, together with experience factors from similar equipment programs, allow accurate forecasting of life-cycle costs.
- Accurate updating of forecasts for timely fiscal planning and apportionment of required research and development, investment and operating funds.
- Allocation of available program funds to each logistic support element based upon its justified need, with emphasis given to program schedule and task priorities.
- Accurate accounting of funds expenditures using work breakdown structure and measurement criteria

to insure proper funds utilization and redistribution.

Information Systems Interface

Defense activities use and support many information systems to meet separate technical management needs of organizations with differing development, support and operational missions. These management data systems are defined in equally diverse directives at various echelons in DOD and the separate Services.

Management Data (MD) systems required by support management functions include:

- Maintenance engineering and analysis control documentation.
- Engineering test and demonstration records.
- Program schedule and cost controls (PERT or critical path).
- Maintenance management and failure data.
- Miscellaneous requirements forecasts, *e.g.*, personnel, equipment, supplies, and facilities.
- Configuration management.
- Operational readiness support status.
- Supply management effectiveness reporting systems.

Early in the development phase of the acquisition life cycle, support management selectively identifies the extent to which the aforementioned information systems will be required during the item's life cycle, when they will be required, and how and by whom the requirements will be met.

These requirements are compatible with current directives from the applicable Service. They should be tailored to the level of detail appropriate to the type, complexity, or cost of the item being developed. Simple off-the-shelf procurements might only require already digested and analyzed information. In that case the appropriate "data system" is a simple information gathering and editing activity.

At the other extreme, the acquisition and operation of new and complex equipment may justify electronic data processing support. Here, standardization of data codes, use of available software, and new generation computer capabilities combine to make data-bank concepts attractive. This approach satisfies all the information requirements of the formal systems, and also permits selective

reporting of current data to functional support managers on an as-required basis.

Information search, acquisition, collation for library storage, selective retrieval, reporting and dissemination (to user-defined specifications) are all data support functions that may, sometimes, be more economically performed under centralized control.

While the management data events shown in the guide recognize these economies, a word of caution is in order. These data systems are oriented to the use of data to "manage," rather than to the "management of data." It is necessary that the functional support managers recognize both the limitations and capabilities of information collection and data processing. At best, only part of the managers' total information requirements can be coded for electronic processing. Managers initiate data/information requirements by close liaison with system analysts and programmers. They must perform continuing validation and analysis of data products. These responsibilities should not be usurped by or defaulted to data services organizations which are primarily a management support function.

Throughout the sequence of events that constitute integrated logistic support planning, the adequacy of management data for use in conducting operations, maintenance and supply tasks is all important. Also, as summary information, it becomes invaluable to the operational and system support commands as well as to other management levels within DOD. Its proper feedback and categorization for use by each of the support elements is a necessity for estimating the existing logistics support capabilities, all "2 events" on the fold-in.

The kinds of things which must be included in "event 2" estimates are:

- Current target operating hours per period of time, typical probabilities of launch for like systems, system mean-time-between-failure experience, and fall-out rates (MR-2).
- Typical maintenance planning problems on similar equipment (MP-2) as well as policies, concepts and organization structures in existence. In other words, what are the limitations on maintenance, by level and location, that the system design and

support engineers will have to recognize in their upcoming trade studies?

- The adequacy of current support and test equipment (portable versus fixed). Does it appear that the basic performance requirements of the new system may require some exploratory work beyond the present state of the art (SE-2)? Is complete self-sufficiency required, or possible, on a Gamma-Goat type Army vehicle? Recovery of larger booster components from land and sea may or may not be able to use current support equipment. What are the limitations?

- The locations and limitations of current supply points as well as their storage and distribution techniques (SS-2).

- The primary and back-up modes of current transportation and handling systems (TH-2).

- Technical data capabilities being utilized (TD-2). These may be display techniques, previous commercial data applications, current deficiencies on like systems, and on-going development of new processes.

- Current area facilities to be examined (FA-2). Included are definitions of trade-off areas needed to define basing, movement, durations, ground rules for facility construction, and constraints on security, easements and ownership.

- Current and anticipated personnel skills, levels, training and forecast manpower availability (PT-2).

- Concept formulation effort funding estimates for all support elements (F-2). Budget and finance criteria for further development of funding requirements must be established. These criteria should lead to a "building-block" approach to both life-cycle cost estimates and required funding.

This information will provide support management with existing capability data to compare to new program capabilities needed. Decisions can then be made on requirements for new study contracts to develop alternative support concepts.

Event 3 provides for the development of support alternatives. The maintainability and reliability element is designated as the focal point for trade-off studies to assure a complete interface between the system characteristics, design and support concepts and gross requirements. These trade-off studies conducted in-house, by contract, or both, must be part of the system engineering feasibility studies.

Selection of concepts (event 4) will be based on these studies and will include projected levels and locations of maintenance, the fault isolation and testing approach, overhaul approach, provisioning approach, materiel management system to be used, gross transport and handling specifications, technical data preparation and distribution methods, etc. These concepts must be adequately detailed for development of support plan requirements (event 5). The support plan requirements are to be included in the Systems Development Plan. They must summarize the support element plan requirements for key approval of the functional baseline and preparation of definition phase contracts. These requirements include such things as:

- Maintainability and reliability goals.

- Criteria for test and demonstration to those goals.

- Maintenance concepts and planning milestones.

- Deployment—where, when and how?

- Maintenance responsibilities by level and location.

- Management and analysis techniques to be employed (type and limitation).

- Government-furnished materiel criteria.

- Equipment development and acquisition criteria.

- Supply support concepts, techniques and program milestones.

- Scope and interfaces of contractor and in-house transportation and handling development effort.

- Technical data development criteria and constraints.

- Facilities specifications by type, location, use and interface.

- Personnel and training criteria for manning policies and priorities, determination of and justification for requirements, personnel utilization, training courses and location, etc.

- Funding schedule criteria for activities in all phases with definitive estimates for definition phase effort and preliminary estimates of life-cycle costs.

- Management data criteria for maintenance engineering analysis control documentation, test and demonstration reports, schedules and cost tracking, item identification and codes, configuration management accounting and control, support status

reports, and supply management effectiveness reporting.

This information is typical of the planning checklist information "by kind" which is included throughout the ILS guide. From this point on, the remaining events covered in this article will be simplified.

Evaluation Criteria for Support Plan

During the definition phase of the development life cycle, evaluation criteria upon which contract proposals may be scored must be established for each applicable support element. Evaluations of the proposed plans are performed and a selection made from which a firm support development plan can be established. This plan becomes an allocation baseline upon which development contracts can be awarded to the selected contractor(s). On some programs, requirements for extensive facilities may result in early design and military construction program action (FA-7 through FA-9). Also, transportation and handling requirements may be part of other system support plans. Concurrent with this definition process a financial plan for support should be prepared and updated. Funds should be confirmed and allocated based on the schedule requirements of F-5.

The development phase events consist of a refinement and apportionment of performance goals and funding allocations as maintenance engineering analyses and detailed design progresses. Other support element resource requirements and procedures are defined and prepared (or procured) for early engineering test and demonstration. If equipment design or support "change action" is initiated, coordination with all applicable design or support elements must be repeated to insure interface compatibility. This control is essential for such cost-critical activities as provisioning, construction and other long lead-time resource commitments.

Inclusion of optimum solutions into the hardware design and support program results in a proposed product baseline, upon which initial production contracts can be awarded. At this point, the "task force" environment may tend to disappear due to the magnitude of developing functional roles and responsibilities. As a result, lack of interface action by support

management could cause oversights and inadequacies which would now result in production errors and improper commitment of follow-on supporting resources. It is, therefore, important that the support management matrix of planning events, designed for any particular program, must have absolute continuity vertically and horizontally to prevent such costly oversights and inadequacies.

This "road map" is just a starting point. Any specific program network must not only be on paper, but the logic of its approach must be understood and recognized by logistic support personnel through education. As mentioned earlier, each support manager must tailor the road-map events to the needs of his own organization and specific program.

Operational Suitability Demonstration

Service testing of the initial production articles may take place in an actual or simulated operational environment. The support demonstrations must assure that:

- Maintenance functions can be performed at the assigned maintenance levels.
- Maintenance tasks can be accomplished by the skill levels specified in the allotted time.
- Support and test equipment can support the maintenance function as planned.
- Technical data correctly describes maintenance tasks to be performed.
- The supply support planning is correct, including distribution and range of spares, repair parts and special supplies.
- Safety factors have been satisfactorily considered.
- Facilities will satisfy intended functions.
- System design for maintainability has been accomplished as specified in the contract.

All support element plans are updated as a result of the demonstration and verification (SM-21). This logistic support plan will be very important to operational organizations receiving the equipment for Service use. The plan provides operational maintenance staff members and commanders with an understanding of the planning projections and backup already taken, upon which their preparations for organizational support

should be predicated. The plan will help guide the development command, the contractor and using commands during delivery, inspection, installation, checkout and initial use of equipment and supporting resources.

Monitoring of support effectiveness during the operational suitability demonstrations is required to determine the degree of achievement of readiness performance specifications within contractually agreed upon test parameters. Specific demonstration requirements should include such things as:

- Measured achievement of specified maintainability and reliability goals.
- Verification of technical data maintenance support procedures.
- Verification of the adequacy of personnel training in specified skills.
- Assessment of the availability of personnel, spares, repair parts, special supplies, facilities, support and test equipment.
- Verification of the range, location and specified use of spares, repair parts, special supplies, support equipment, etc.
- Assurance that maintainability, reliability, safety and human engineering characteristics in both equipment design and support are adequate.

Support deficiencies will be identified and analyzed, using test data collected to satisfy maintenance demonstration requirements (MD-22). The results of these analyses become part of the logistic support evaluations (SM-23).

The plan for the operational suitability demonstration must specify personnel as test conductors who are experienced in operational maintenance of similar equipment and assigned as evaluators (umpires, not technicians). The team will include contractor and Service participants under project manager direction. Proposed modifications to hardware and support resulting from evaluations are analyzed for changes to the support plan. Recommendations are made for hardware design changes where trade-off studies justify them as effective improvements. These actions are conducted in accordance with applicable configuration management directives and instructions. The revised plans are used by follow-on operating units and their appropriate commands.

In summary, the central theme of integrated logistic support is management—management which is oriented to life-cycle mission objectives. It is not a new fad or cult. It is achieved by central management of all support elements, however anyone may choose to define them. Properly and selectively applied by program managers, ILS planning will encourage design innovation, rather than restrict it. It can improve system performance and availability. It can minimize schedule delays and cost overruns by planning support actions rather than reactions.

In aiming at the objective—mission ready units—integrated planning of logistic support must be achieved through sound management at all levels of responsibility. Success depends upon a sound working relationship between support management and system design. It is our opportunity to increase readiness and control mission costs by design rather than chance.

Collapsible Chair Prevents Shock

The combined research efforts of the U.S. Navy and industry has resulted in safety collapsible chairs mounted on small craft, designed to protect men exposed to shock motions from underwater explosions.

Idea for the new safety device was suggested by General Motors' safety collapsible steering column which can collapse as much as eight and one-fourth inches at a controlled rate in the event of impact.

As a result of a working agreement between the Navy and General Motors, the collapsible column principle was applied to shipboard chairs and deck platforms greatly reducing the danger of casualties resulting from shock blasts.

River patrol boats now in use by troops in Vietnam have been equipped with shock protection chairs and deck platforms. Each chair and platform unit uses eight of the energy-absorbing columns.

The advantage of the newly developed collapsible columns, over other devices, is their durability and suitability for shipboard use, in addition to being an inexpensive, mass-produced item readily available for immediate application.

Youth Opportunity

Help Young People To Help Themselves

Hubert H. Humphrey
Vice President of the United States

[Editor's Note: Vice President Humphrey is Chairman of the President's Council on Youth Opportunity. He has frequently said of this responsibility, "Of all my work in government, none has been more challenging, nor rewarding."]

We in America have an important job ahead of us this summer. The job is youth opportunity—helping young people, especially the poor, to help themselves through work, play and learning.

Poor youth have special summer needs. Most of them can look forward only to heat, idleness and boredom in the summer months. Most schools are closed. There is a tragic lapse of training, activity and supervision. For far too many, there is no work, no fun, and no place to cool off.

These young men and women desperately need opportunities—the kind of opportunities that stretch across 12 months, not just the 9 months of the regular school year.

They especially need jobs. A vast majority of those old enough to work, want to work. They want to earn and learn, to pay their own way, to achieve a sense of personal worth.

Millions do not get that chance. Last summer there were 1.5 million young people, 16 to 21 years old, who sought work but did not find it. Probably an equal number did not even bother to look because they knew it was hopeless.

They need a variety of things to do. Earning and learning are the top priorities, but within the accomplishment of each lies the intangible—motivation, inspiration, creativity, a sense of self-worth, a healthy body. A place to play and somebody who will listen, a chance to express what is felt and seen, a chance to compete, just plain fun—these, too, are essential.

For the younger ones, this might mean regular chances to swim in a portable pool or romp in a fire hy-

drant sprinkler, games on a closed street with mobile recreational facilities, a week of camping, visits to the ball park, a chance to play ball, a ride on an airplane or a train.

The older ones require varied programs which can accommodate a multitude of individual interests and needs. They especially need a sense of running their own show.

All age groups need people, too—people who will show them how, tell them why, and give them hope. Few have had the advantages of a normal family life, a safe neighborhood, a good school. A sympathetic supervisor, counselor, or volunteer leader thus becomes the central focus of the program and the key to its success.

Providing opportunities for youth to work is a job tailor-made for defense contractors. It is a unique opportunity to serve humanity. Serving humanity, of course, means helping people to help themselves—working with them, not for them. This is something Americans have always believed in, and worked toward.

Throughout our nation this summer, people from all walks of life are forming a new partnership, a partnership that embodies the hopes of America in 1968.

Government is involved, but so are business, labor, the schools, churches,

young people themselves, civic groups, and many more.

The goals are clear: Good jobs, not menial tasks; good schooling, not closed doors; good recreation, not just a basketball hoop.

You, your organization, your church, your neighborhood, your place of business or employment—all can join this partnership.

Too many of us await the leadership of our organization, our city government, or somebody else. But individual initiative is the key in helping people. You can act individually, and I ask you to do so.

Here are some suggestions:

- **Organize your community.** Talk with your mayor. You can ask him what the city government is planning to do for youth this summer, point out overlooked needs and unused resources, and volunteer your help and services.

- **Take an inventory of needs and opportunities.** How many young people in your community will need help finding work this summer? How many will have no access to regular recreation?

You can locate unused resources such as National Guard armories, vacant lots, abandoned buildings. You can arrange to use nearby military facilities when they are not otherwise in use. You can establish machinery to locate half-filled theaters and buses, empty seats at the ball park and concert, vacant camp beds. You can help assure that those facilities are used.

- **Find jobs.** This is perhaps the most important task, and it is a task in which members of industry can provide special help.

You may have direct hiring authority or be in a position to urge adoption of company policies to open more jobs for the young. And when young people come to work in your business or plant, you can give them a helping hand. Remember how fear-



Hubert H. Humphrey

(Continued on Page 16)

Bidding on Government Contracts

Zero Defects Program Works Here, Too!

Herbert G. Fredericks

While it has generally been conceded that a Zero Defects Program is applicable to production lines and routine paperwork, it is undoubtedly true that much bidding effort is wasted and many contracts lost as a result of poor bidding practices. Generally speaking, those defects are applicable to both the preparation and submission of bids in formal advertising, and quotations and proposals in negotiated procurements. For the purpose of this article, generally no attempt is made to distinguish between bids, proposals and quotations, all of which under the new Standard Form 33 are designated as "offers."

Late Delivery

The late receipt of an offer which is not entitled to consideration is tragic for both the Government and industry. Considering the effort which goes into the preparation of an offer, it seems elementary that industry would take the effort to establish a record of zero defects in this area. The failure of an offer to receive consideration in many cases results in the Government paying a higher price for the item required, than would have been the case had the offeror taken steps to insure timely submission of his offer. In some instances when no other reasonable, responsive offers are received, the effect is the delay and cost of resoliciting.

The problem of the late offer generally arises under two sets of circumstances. The most common is the situation in which an offer is mailed by ordinary mail but, due to a delay in the mails (which is not uncommon), it is not received in time. Another cause of the late offer is the unexpected happening when it is delivered by a representative of the offeror. Every procurement office has been the recipient of the tale of woe

of the salesman who, due to the breakdown of his automobile, a minor or major accident, or a roadblock of some kind, arrives a few minutes too late.

One occurrence which illustrates the dangers of hand delivery may emphasize the point. A firm, which had participated in the development of an item and had obtained the first production contract, spent considerable effort vainly trying to convince the government agency that it should be given the second production contract on a sole-source basis. When the solicitation for the second contract was issued, it provided that the time for submission of offers was 2 p.m. on March 15. Thereafter, two amendments to the solicitation were issued setting the time for opening at 2 p.m. on two new dates. However, when the third and last amendment was issued, all of the bid opening rooms of the agency were already scheduled for 2 p.m. openings, so the opening was rescheduled for 10 a.m. on a specified day. To make a long and tragic story short, since the main office of the bidder was in the same area as the government agency, about 1 p.m. on the day of the opening, in strolls the sales manager congratulating himself that he had allowed plenty of time to get to a 2 p.m. opening. As is so often the case, the sales manager did not read all of the fine print on the last amendment with regard to time of opening and assumed erroneously a 2 p.m. opening. Unfortunately, his offer could not be considered since it was a late handcarried offer. If at least one copy of the bid had been mailed the previous afternoon by certified mail, it undoubtedly would have been received by the 10 a.m. opening time, and the sales manager's error as to opening time would have been of no effect.

The solution to the problem of the late offer is so simple that the vast majority of rejected late offers could be avoided with a minimum of effort. Item 8 of the Standard Form 33A (Solicitation Instructions and Conditions), entitled "Late Offers and Modifications or Withdrawals," specifies in detail how proof of mailing by registered or certified mail receipt, postmarked and if possible the exact time of mailing initialed by a postal employee, will be accepted to prove timely mailing and thus require the acceptance of an offer received after time for opening, if due solely to a delay in the mails.

Item 5 of Standard Form 33, entitled "Submission of Offers," points the way to having as much time as possible for the submission of a timely offer and yet insuring a timely submission. Item 5 provides, in part, that offers may be modified by telegraphic notice, provided such notice is received prior to the hour and date specified for receipt. Rather than risk a late submission, it is suggested that a tentative offer (not so designated) be sent by registered or certified mail in sufficient time for arrival at the opening office as required and that, if necessary, a last minute modification be made in the offer by timely telegraphic notice.

There is another unusual procedure which may on occasion be used to minimize the possibility of a late unacceptable offer. Although there is usually a requirement that offers be furnished in duplicate or triplicate, the Armed Services Procurement Regulation (ASPR), paragraph 2-405(i), provides that the failure to furnish the requisite number of copies is a minor informality which will be waived. Accordingly, if there is a question as to whether there is sufficient time for mailing, the offer

should be prepared in duplicate, or as many copies as required, and one can be mailed and another copy hand delivered.

There is one caveat, however, that applies to both mailed and telegraphed offers or modifications. Many government agencies require both types of communications to be delivered to a communications center and the normal time for processing, through such a center to the specific place of opening, must be considered in determining whether an offer was mailed or telegraphed in time to have been timely delivered.

Representation at Public Openings

Is it worthwhile to be present at a formally advertised solicitation opening? Generally there is no necessity for an offeror to be represented at a formal solicitation opening. (Box 2 on Standard Form 33 will indicate that a solicitation is either advertised or negotiated. Only advertised solicitations permit public opening of offers.) Usually the abstract of bids can be obtained from an information service organization or the government agency itself. The advantage of being present at the opening in formal advertising being slight, the question should be resolved on the basis of cost. Considering the place, time of opening, and the value of the potential award, is it economically wise? The main advantage to being present at the opening is the opportunity afforded, under ASPR 2-402.1(c), to examine the bids with a view to protesting the award to an apparent low offeror who may have qualified his offer in some manner, although normally the government agency will reject such an offer on its own initiative. Much valuable information can be obtained from an examination of the abstract of bids at the bid opening or as obtained through an information service. The extent of the competition, who is the competition, and the price range are available. Although the contracting officer is required to question apparent mistakes in offers, a mistake is not always apparent, particularly when there is a limited number of bids. Errors should be more obvious to knowledgeable members of the industry in question, and a bidder may conclude that he has made an error

and immediately assert such an error.

In connection with personal attendance at bid openings, there are probably some lessons to be learned from an incident which took place at the Pine Bluff Arsenal some years ago. A few minutes before time for bid opening, Bidder A said to Bidder B, "What is your price?" The latter responded, "\$1.05 each." Whereupon, Bidder A pulled a piece of paper from his pocket on which he wrote something, folded it, and handed it to the bid opening officer. The note read, "I modify my bid and change my price to \$1.04. Signed Bidder A."

Non-Responsive Offers

As a general principle, an offer in formal advertising will be declared non-responsive and rejected, if the bidder takes exception to any of the essential requirements of the invitation which usually include FOB point, delivery schedule, liability to the Government, or the rights of the Government under any of the clauses of the proposed contract. An infrequent but easily avoided basis for rejection of bids is the inadvertent conditioning of bids. A typical example of this is the use of printed stationery to trans-

mit the bid (no letter is necessary) which contains some language indicating that "all quotes are subject to price in effect at time of delivery" or "not responsible for delay in deliveries caused by (reason)." In some cases such offers have been rejected as having been conditioned by the letter of transmittal.

Perhaps the best rule regarding the submission of a letter of transmittal with a bid is "don't". Since this article is not intended to be a comprehensive legal treatise, it is not intended to imply that a letter of transmittal should never be used in "advertised" as distinguished from "negotiated" procurements, but to do so is dangerous. If there are any ambiguities in the solicitation or the referenced documents, it is important that they be clarified (if at all) before the bid is submitted. The importance of this procedure is emphasized by a case in which an offeror stated in bold type "This letter does in no way qualify my bid," but then went on to say that he assumed that water emulsion would be used on all phases of the job. The specification required oil emulsion on one phase of the job, and the bid was rejected as non-responsive. Government purchasing agents are reasonable people and welcome the opportunity to clarify, by an amendment (including an extension of time for submission of offers), anything which could lead to misunderstanding. Necessary clarification can be obtained upon request before submitting an offer.

The antithesis of furnishing too much information, which may make an offer non-responsive, is the failure to furnish some essential information which will have a similar effect. The failure to furnish when required by the invitation the items listed below has resulted in rejection of bids:

- A guaranteed weight.
- Place of origin or shipment.
- Descriptive literature.
- Evidence of authority to use government facilities.

One of the most annoying and frustrating reasons for rejecting an offer is the failure of the offeror to acknowledge receipt of an amendment to a solicitation which is material. It matters not whether the amendment was properly mailed or received by the offeror, the failure to acknowledge it in most cases results in the rejection of the offer. Again there



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are several ways in which any offeror can protect himself. If the contract is of sufficient importance, the offeror should telephone the government representative designated in Block 9 of Standard Form 33 several days before opening and determine what, if any, amendments have been issued by the Government and, if necessary, make arrangements to obtain and acknowledge all amendments. Similarly, if a representative of the offeror is to hand deliver the offer and to attend the opening, he should make similar inquiry as far in advance of the opening as is practical.

Protection as to Quantity

One of the most important conditions of the Standard Form 33 is number 10, entitled "Award of Contract", and, in particular, paragraph (c) which reads:

"(c) The Government may accept any item or group of items of any offer, unless the offeror qualifies his offer by specific limitations. **UNLESS OTHERWISE PROVIDED IN THE SCHEDULE, OFFERS MAY BE SUBMITTED FOR ANY QUANTITIES LESS THAN THOSE SPECIFIED; AND THE GOVERNMENT RESERVES THE RIGHT TO MAKE AN AWARD OF ANY ITEM FOR A QUANTITY LESS THAN THE QUANTITY OFFERED AT THE UNIT PRICES OFFERED UNLESS THE OFFEROR SPECIFIES OTHERWISE IN HIS OFFER.**" (Capital print in original.)

Since this provision now applies to both advertised and negotiated procurements, it is more important than ever that government contract offerors take advantage of the opportunity provided to condition their offers with respect to items or quantities. If the Government, for example, requests offers on 25 different items consisting of equipment and spare parts, it is conceivable that the total value of item one, the major piece of equipment, would be in the thousands of dollars, and that some of the other line items would be valued in the tens of dollars. Yet, unless the offeror qualifies his offer, he could conceivably be required by an award to furnish a single line item of repair parts. Obviously, if the price of the line items of spare parts was based on receiving the award of the major items of equipment, this could

result in a loss contract or, at best, a very annoying one.

Since Condition 10 permits the offeror to qualify his offer, it is appropriate to specify that an award will be accepted as a minimum for a certain group of items, or a certain minimum dollar value. It would be proper in the example cited to state that no contract would be acceptable for any of the items of spare parts (items 2 through 25) unless an award of item 1, the major piece of equipment, is also made to the offeror.

The second sentence of paragraph c of Condition 10, in many situations, poses a greater danger to an offeror who fails to protect himself. For example, if the Government requests offers for 100,000 units and the offeror, based on the quantity, offers a price of \$1.00 per unit, usually the Government would accept the offer for the 100,000 units but, under the terms of Condition 10, the Government

could award the contract at \$1.00 per unit for 50,000 units or 10,000 units, or even 1 unit. In other words, an unqualified bid of 100,000 units at \$1.00 each means any quantity from 1 to 100,000 at \$1.00 each.

Since the offeror may specify "otherwise in his offer," it is recommended that the minimum quantity which will be acceptable at the price bid be stated, i.e., "Minimum acceptable order 90,000 each." A better bid would be range bidding. For example, "100,000 at \$1.00 each and for quantities less than 100,000, an increase of 10 percent in unit price for each decrease in quantity of up to 10,000 units, i.e., 90,000 to 99,999 \$1.10 each; 80,000 to 89,999 \$1.20 each; etc."

The axiom that something worth doing is worth doing right is most applicable to offers on government contracts.

Youth Opportunity

(Continued from Page 13)

ful and inexperienced you were on your first job. That will guide you on how best to help them.

Don't let little things stop you. If a businessman can't productively employ a young person, he can provide financial support to others who can. Oklahoma City has a Job Alert task force which uses donations to pay young people for work in civic projects.

You can get your church to organize the congregation's young people in an "odd jobs shop." Find out which youth want to mow lawns, paint houses, trim shrubs, etc. Then get members of the congregation to call the church when they have work available.

- **Keep the schools open.** Do everything possible to keep school facilities in your community open during the summer. We have more than \$80 billion in school facilities and we lock them up for three months every year. That is a tragic waste. You can help to assure that the gyms, the libraries, the shops, the typing and sewing rooms are not locked up for the summer.

- **Provide recreational opportunities.** You can directly aid inner city youth by supporting expanded summer camping, in-town swimming pools,

other sport, recreational, and cultural activities.

You can send a poor youth to summer camp for a week, and urge your friends and organization to do the same. A week at camp can cost as little as \$25 to \$50 per camper.

The American Camping Association has informed me that as many as 15 to 25 percent of publicly supported camps have vacant bunk beds for boys and girls. There are vast numbers of poor youth who will never get near a camp unless you and others help raise funds to get them there.

I ask you to help mobilize financial support in every community. Cooperate with local Fresh Air funds. Set your goal at helping as many poor youth as possible to enjoy the immensely beneficial experience of camping.

- **Provide for year-round efforts.** We have learned from previous summers that it is essential that the benefits of summer programs be carried over into the fall, winter, and spring. Summer programs must be continued in the school year or merged into on-going, year-round efforts.

The poor youth of America are rich in potential, but poor in opportunity and in a sense of participation in American society. Now is the time to reach them, before they grow into adulthood marred by the indelible stigma of deprivation.

Cost Contractor's Liability for Damages

Frank Reda

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The right of a contractor to sue the Government for breach of contract damages has never been questioned. It has been reaffirmed in a plethora of recorded cases. Similarly, the right of the Government to sue a *fixed price* contractor for breach of contract damages is equally well recognized. Ample precedent exists.

Curiously, there is a marked scarcity of cases in which the Government has sought breach of contract damages against a *cost reimbursement* contractor. This fact is rather startling, especially since we have been engaged in cost contracting for half a century.

The Government's first experiment with cost reimbursement contracting took place early during World War I. While there was little resort to this form of contracting between the two world wars, it returned to popularity in 1940. At that time, the tremendous increase in war procurement, coupled with the recurrence of an unstable labor and material market, compelled the wide use of cost reimbursement contracting.¹ Although the current accent is on the use of fixed-price contracting, cost reimbursement contracting continues to be employed appreciably,² particularly in exotic research and development projects such as those encountered in space and missile programs.

¹ *Air Force Manual 110-9, Procurement Law*, at 7-1, date 1 May 1964.

² Keyes, "The Responsibility of a Government Cost-Type Contractor," 22 *Fed. Bar J.* 68.

Yet, despite the huge volume of cost reimbursement contracting experienced during the past 50 years, there has been an almost stark absence of damage suits filed by the Government against delinquent cost contractors. The author has been able to uncover only two such suits.³

This judicial void may well be symptomatic of underlying restraints inherent in cost-type contracts. It gives rise to the thesis that maybe the Government has no legal right to sue a cost-type contractor for breach of contract damages.

The soundness of this thesis will be examined here.⁴

Nature of Cost Contracts

It is often stated that government contracts are basically the same as contracts between individuals, and that the rights and liabilities of the parties are substantially the same as those of the parties to private agreements. Either party to a government contract is, of course, capable of breaking it. When this happens, the parties are usually subject to the same rules of law as are applied in a breach of contract between private parties.⁵

The common law right to damages for breach of contract is rooted in our Anglo-Saxon system of jurispru-

³ *United States v. Duggan*, 210 F. 2d 926 (8th Cir. 1954); *United States v. Bentley*, 16 F. 2d 895 (2nd Cir. 1927).

⁴ While this inquiry may be applicable generally to all Government departments utilizing cost reimbursement contracts, it is directed specifically to procurement by Department of Defense contracting agencies governed by the Armed Services Procurement Regulation (ASPR).

⁵ *Maxwell v. United States*, 8 F. 2d 906 (4th Cir. 1925), affirmed without opinion, 271 U.S. 647 (1925).

dence.⁶ In the ordinary case, no question arises as to the right of an injured party to claim default damages. But a cost reimbursement contract presents a unique situation. It contemplates that the actual cost of the entire work and the risks are to be assumed by the Government. It guarantees that the contractor will emerge unscathed monetarily, regardless of contingencies.⁷ Unlike the fixed price contractor, a cost reimbursement contractor is not generally permitted to include every contingency,⁸ or risk, as part of his allowable costs of doing business.

Philosophical Restraints

The Comptroller General of the United States has the responsibility, among other things, of resolving disputes between the Government and contractor-claimants.⁹ In the exercise of this responsibility, he has rendered a number of decisions touching upon the nature of a cost reimbursement agreement. On several occasions he has alluded to the proposition that such an agreement is a virtual *guarantee* against any loss to the contractor.¹⁰ Yet, despite this broad assertion, he has indicated that there are limits to the Government's liability. He pointed out that a cost reimbursement agreement does not necessarily mean that the contractor is relieved of any and every loss.

Expanding on this premise, the Comptroller General established five tests which the contractor must meet before he can expect reimbursement of expenses: the expenses must be reasonably incident to the work; not presumed to be included in the fee;

⁶ 30 *Comp. Gen.* 191 (1950) and numerous authorities cited therein.

⁷ 20 *Comp. Gen.* 632 (1941).

⁸ ASPR 15-205-7.

⁹ 31 U.S.C. 41-434.

¹⁰ 20 *Comp. Gen.* 632 (1941); 21 *Comp. Gen.* 466 (1941).

serve a useful purpose in fulfilling contract requirements; *not result from the absence of due care by the contractor*; and not be in contravention of the law.¹¹ He added, somewhat significantly, that the benefits and liabilities of the contractor are dependent upon the terms of the contract, rather than upon the basis of any general theories relating to the nature of cost-type agreements.¹²

In one early opinion, the Comptroller General expanded specifically on the philosophical aspects of a cost reimbursement agreement. He took note of the tacit understanding that the cost of the work and the risks are assumed by the Government regardless of contingencies. He cautioned, however, that this does not permit the contractor to escape the costs of his own fault or folly; that the Government does not underwrite careless conduct or disregard of contractual duties; and that the provisions for reimbursement are not to be taken as a shield for incompetence.¹³

The frame of reference of these latter observations was a cost-plus-fixed-fee contractor's attempt to obtain reimbursement from the Government for damages the contractor was forced to pay to an injured third party. That case did not concern the question of a suit for breach of contract damages by the Government. However, the Comptroller General detected no underlying philosophical reason why a cost-type contractor should not be made to bear the financial burden of damages wrongfully inflicted upon a third party. Perhaps it would not be illogical to urge, *a fortiori*, that there is no underlying philosophical reason why a cost-type contractor should not be made to bear the financial burden of damages wrongfully inflicted upon the Government itself.

Judicial Precedent

Two cases could be found treating the subject of a cost reimbursement contractor's liability for breach of contract damages.¹⁴ In 1927, the United States circuit court of appeals heard the case of *United States v. Bentley* in which the Government

brought a suit for damages against a cost-plus contractor founded on an alleged breach of the contractor's contractual duty to "use its best efforts * * * to protect and subserve the interest" of the Government. The suit was denied, after full consideration on the merits, because of lack of proof. Significantly, no mention was made of the possibility that the cost contractor might be automatically insulated against a breach of contract suit for damages.

In 1954, the United States circuit court of appeals heard the case of *United States v. Duggan*. This case dealt with an appeal from an order of a district court dismissing with prejudice a claim of the United States against a cost-type contractor for, among other things, breach of contract damages. Because of the Government's success, a closer look at this case is warranted. The claim was based upon the contractor's default in the performance of a supply contract which obligated him to make and deliver 90 gliders and spare parts. The Government had agreed to pay all costs, plus fee, upon satisfactory delivery. The contractor failed to make deliveries as promised and, in consequence, he was terminated for default. Shortly thereafter the contractor was adjudicated a bankrupt and his assets were ordered to be sold. But before his assets could be sold, the contractor petitioned for reorganization as a subsidiary of another company.

Several proofs of claim were filed by the Government against the contractor in the reorganization proceedings, including a claim for damages stemming from the contractor's failure to deliver 89 of the 90 gliders promised. The Government claimed entitlement to excess costs generated by procuring the 89 gliders from another source.

The district court had dismissed the Government's claim for various reasons, one of which was that the right of recovery should have been settled administratively under the contract. The circuit court of appeals disagreed. That court found nothing in the "Termination" clause, or elsewhere in the contract, which provided for an administrative determination of the Government's claim for damages. The circuit court concluded that the Government had stated a claim which entitled it to a trial on the

merits, and suggested that the Government would be able to collect damages on the basis of "any loss proximately resulting from the failure of the contractor to perform its obligations under the contract."

The case was remanded to the district court with directions to reinstate the Government's claim and to take further proceedings not inconsistent with the opinion handed down by the circuit court. The fact that a cost-type agreement was involved did not seem to disturb the circuit court or inhibit its decision.

These two decisions reign in solitary splendor. A void preceded them; a void followed them. One is at a loss whether to hail them as landmarks or to regard them as curious relics.

Taken at face value, the *Duggan* decision, at least, tends to support the proposition that there is no inherent philosophical objection to the Government's entitlement to damages against a delinquent cost-type contractor.

Purists may disagree. They might point out, with some propriety:

- That the precise issue of Government's entitlement to damages against a cost-type contractor was neither raised by the parties litigant nor squarely decided by the court.

- That, in any event, the damages there concerned *reprocurement costs*, which costs evidently are no longer assessable against a cost-type contractor.¹⁵

More recently, the Supreme Court of the United States observed in *obiter dictum*:

... the cost-type contractor has undertaken contractual obligations. If he properly performs his contract, he earns his fee; if he does not, he may lose the contract, *be liable for damages* and be forced to liquidate the organization which was built to perform the contract."¹⁶

¹⁵ ASPR 8-407 provides, in part, that a "cost reimbursement type contract does not contain any provision for recovery of excess costs of reprocurement after termination for default." But see Air Force Procurement Instruction (AFPI) 8-601.53 which suggests that reprocurement costs may be pursued in some cost-type situations.

¹⁶ *United States v. Boyd*, 378 U.S. 39 (1964).

¹¹ 21 Comp. Gen. 466 (1941); 21 Comp. Gen. 149 (1941).

¹² 22 Comp. Gen. 250 (1942).

¹³ 21 Comp. Gen. 149 (1941).

¹⁴ Note 3, *Supra*.

The issue then before the Supreme Court involved amenability of two cost reimbursement contractors to the Tennessee State sales and use taxes in connection with certain purchases made by them on behalf of the Atomic Energy Commission. It was argued by the contractors that they were engaged in furnishing services only; that they had no investment or risks under their cost-type contracts. This defense prompted the above-quoted reply of the court. To be sure, the court was not called upon to decide the question of a cost-type contractor's responsibility for breach of contract damages. The force of its observation is thereby diluted. Yet, it is a straw in the wind. It adds stature to the *Duggan* decision.

This slender chronicle of judicial precedent is not imposing. But it underscores the previously noted decisions of the Comptroller General. On balance, it might be fair to surmise that there is no philosophical reason why a cost-type contractor may not be answerable to breach of contract damages.

Contractual Restraints

Philosophy aside, it is imperative to examine the contract itself to learn whether a suit for damages will lie.¹⁷ The parties may well have provided for *indemnification against default damages*, or for an *exclusive administrative remedy* in the event of default.¹⁸ A contractual provision for either remedy, clearly and expressly stated, will prevent the Government from seeking relief in the courts.¹⁹

Indemnification. It was not unusual during World War II for cost-type contracts to contain an indemnity clause which had the effect of relieving the contractor from almost all financial responsibilities, including damages. A typical indemnity clause employed during that era read somewhat as follows:²⁰

¹⁷ 22 Comp. Gen. 250 (1942).

¹⁸ *United States for Use and Benefit of Armco Drainage and Metal Products, Inc. v. Vander Heyden*, 158 F. Supp. 930 (D.C.S.D. Ill. 1958).

¹⁹ *United States v. Paddock*, 178 F. 2d 394; cert. den., 340 U.S. 813 (1950).

²⁰ *Federal Cartridge Corp. v. United States*, 77 F. Supp. 380 (1948); 24 Comp. Gen. 244 (1944).

Responsibility of Contractor. It is the understanding of the parties hereto, and the intention of this contract, that all work under this contract is to be performed at the expense of the Government and that the Government shall hold the contractor harmless against any loss, expense (including expense of litigation), or damage (including liability to third persons because of death, bodily injury or property injury, or destruction or otherwise) of any kind whatsoever arising out of or in connection with the performance of the work under this contract, except to the extent that such loss, expense, damage or liability is due to the personal failure on the part of the corporate officers of the contractor, or other representatives of the contractor having supervisory or direction of the operation of the plant as a whole, to exercise good faith or that degree of care which they normally exercise in the conduct of the contractor's business.

Interpreting this clause, the Court of Claims held that the contractor would be "reimbursed for every sort of expense or liability incurred as a result of the carrying out of the contract, with the sole exception of such expenses as were incurred as a result of the Plaintiff's officers to exercise good faith or that degree of care which they exercised in carrying out



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their own business."²¹ In short, the indemnity clause covered practically all contingencies and risks, apparently including breach of contract damages.

Indemnity clauses now in use are not quite so broad. They are invariably limited to particular losses and expenses; they contain no blanket waiver of the Government's right to sue for breach of contract damages. It would seem that a lower degree of legal responsibility was intended to be placed upon the contractor under earlier contracts which contained the broad indemnity clause, than would be the case with respect to the typical cost-type contracts now in use.²²

Exclusive administrative remedy. In certain isolated elements of performance, current cost-type agreements establish an administrative avenue for the assessment of damages by the Government. Two examples are found in the *Government Furnished Property* clause²³ and in the *Inspection of Supplies and Correction of Defects* clause.²⁴ Other examples might be found in the *incentive* features of cost-plus-incentive fee (CPIF) contracts. Under the CPIF concept, the contractor's failure to meet required delivery schedules or performance parameters can call for a downward readjustment of the fee.²⁵ In a real sense this may be classed as a form of administrative assessment of damages.

Apart from these few exceptions, cost reimbursement agreements now in use do not provide for administrative settlement of damages inflicted upon the Government. Liquidated damage clauses are not often employed.²⁶ Moreover, the "Termination" clause used in such agreements,²⁷ while available to the Government as a last resort, probably is

²¹ *Federal Cartridge Corp. v. United States*, supra note 20.

²² Keyes, "The Responsibility of a Government Cost-Type Contractor," supra note 2.

²³ ASPR 18-703, Subparagraph (g).

²⁴ ASPR 7-203.5.

²⁵ See DOD Incentive Contracting Guide (1965).

²⁶ ASPR Section VII, Parts 2 and 4; ASPR 18-113.

²⁷ ASPR 8-702(a).

not meant to be its exclusive remedy. The Government could be in an awkward position if this were so. Some critical procurements are not susceptible of termination action. It would gain the Government nothing to terminate a *sole source* procurement. In other cases, it would sorely handicap the Government to terminate a procurement vitally needed where time will not allow reprocurement action. The Government is practically compelled to accept late deliveries in these two instances. Fairness dictates that the Government should be free to accept late deliveries and seek redress in damages, without having to resort to termination of the contract. While no precise authority can be cited to support this statement in the context of a cost reimbursement agreement, it is evidently implicit in the nature of all government contracts.²⁸

In any event, if the Government is forced to resort to termination action, the standard "Termination" clause itself permits the Government to seek default damages. It states, in part, that the Government reserves the right to pursue "any claim which the Government may have against the contractor in connection with the contract."²⁹ Similar language has been held to constitute a reservation of the Government's right to sue for breach of contract damages.³⁰

Estoppel

An alluring theory of estoppel is prompted by the recent Court of Claims decision in *Tektronix v.*

²⁸ ASPR 8-602.7, AFPI 8-601.51 (a), and Section 10-8 of AFM 110-9—all support the proposition that the Government may pursue damages against a delinquent contractor quite independently of the "Termination" clause. These references do not exclude cost reimbursement contracts.

²⁹ ASPR 8-702(a), Subparagraph (g). But note the more specific reservation contained in the "Termination" clause of fixed price contracts, ASPR 7-103.11:

"The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract."

³⁰ *United States v. Duggan*, *supra* note 3.

United States.³¹ The court came up with a rather interesting opinion. It suggested that *past inaction* could estop the Government from asserting present rights.

Tektronix, the owner of certain patents, had sued the Government for damages arising out of alleged unauthorized use of the patented inventions. In an unusual move, the Government filed a counterclaim against *Tektronix*, contending that *Tektronix* had used various government-owned patents without authority.

The court, in rejecting the counterclaim, reviewed the long-standing administrative practice of the Government in allowing free use of government-owned patents. The Court found that the Government had encouraged free, non-exclusive royalty-free licenses to anyone who applied for them. It has even permitted free use of its patents by those who failed to apply for licenses. In view of this long-standing and publicly announced administrative practice, the court held that there was tacit approval of *Tektronix's* use of the government-owned patents which constituted an *implied license* to use them.

The court compared this situation with the free use made of public lands prior to the enactment of statutes which authorized heads of departments to regulate the use of such lands. This privilege developed into an implied license growing out of the custom of nearly 100 years.

It probably can be argued with some logic that the *Tektronix* rationale will bar the Government from suing cost reimbursement contractors for default damages. It is an intriguing theory, but there are some flaws.

- There has been no publicly announced policy to the effect that damages will not be sought against delinquent cost-type contractors.

- There is no "long-standing administrative practice" to excuse cost-type contractors from default damages. True, the Government has rarely found it necessary to sue for damages. But it has done so.

- The Government's right to de-

fault damages was reiterated by the Supreme Court as recently as 1964.

- The paucity of lawsuits can perhaps be explained on a basis other than that of implied waiver. In earlier cost-type agreements, a broad indemnity clause had been inserted which protected the contractor against damage claims. More recently the contractor is permitted to obtain insurance protection against most types of damage risks,³² and in some instances is now indemnified against particular loss or damage not compensated by insurance or otherwise.³³

- The *Tektronix* decision turns on the premise that the Government had, in many ways, actually encouraged private use of government-owned patents. This premise obviously has no parallel in situations where the Government has been injured as a result of breach of contract.

The *Tektronix* rationale seems to be of doubtful application here.

Conclusion

Cost-type agreements now in general use evidently contain no *inherent* bar to the Government's right to breach of contract damages. While few authorities point directly to this conclusion, no authorities point directly to the opposite conclusion. The right of an injured party to seek default damages is fundamental. It cannot be lightly dismissed. In the absence of clear direction to the contrary, it should not be dismissed lest the sanctity of cost-type agreements be destroyed. It is recognized that many cost-type agreements call merely for the contractor's *best efforts* to meet schedule or performance goals. Failure to meet these goals under a *best effort* agreement would not, of course, constitute breach of contract. But where the contractor has solemnly promised to meet a stated delivery schedule or to attain a specified performance goal, he should be held to his promise.

From the contractor's point of view, default damages may well exceed the amount of fee. This is undesirable. It can lead to a lack of enthusiasm from industry for cost-type agreements. From the Government's point of view, the present

(Continued on Page 39)

³¹ Ct. Cls. No. 79-61, 15 Oct. 1965. Indebtedness is acknowledged to Mr. Joseph G. Twomey, Associate Counsel, Lockheed Missiles & Space Company, who suggested this theory.

³² ASPR 15-205-16. These insurance costs are generally reimbursable.

³³ *Ibid.*



MEETINGS AND SYMPOSIA

JUNE

Atomic Physics Conference, June 12-15, at New York University. Sponsors: Army Research Office—Durham, AEC, National Science Foundation, Air Force Office of Scientific Research, Office of Naval Research, New York University, Brookhaven National Laboratory and the International Union of Pure and Applied Physics. Contact: Robert Mace, Director, Physics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285.

Multivariate Analysis Symposium, June 17-22, at Dayton, Ohio. Co-sponsors: Aerospace Research Laboratories and Wright State University. Contact: Dr. P. R. Krishnaiah (ARM), Aerospace Research Laboratories, Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3761.

Bioastronautics and the Exploration of Space Fourth International Symposium, June 23-27, at San Antonio, Tex. Sponsor: Aerospace Medical Div., (AFSC). Contact: Dr. Mitchell (AMRS), Aerospace Medical Div., (AFSC), Brooks AFB, Tex. 78235, Phone (512) LE 2-8811, Ext. 3211.

JULY

High Temperature Chemistry Conference, (dates undetermined), in Crystal Springs, Wash. Sponsor: Office of Aerospace Research. Contact: Dr. Donald L. Ball, Air Force Office of Scientific Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5337.

Fourth Annual Marine Technology Society Conference and Exhibit, July 8-10, in Washington, D.C. Sponsor: Marine Technology Society. Contact: Ted Evans, Conference Management Organization, Inc., Sheraton Park Hotel, 2660 Connecticut Ave., N.W., Washington D.C. 20008.

Crystal Growth Conference, July 15-19, at the University of Birmingham, England. Sponsors: Air Force Cambridge Research Laboratories,

U. K. Ministry of Technology, International Committee on Crystal Growth and the International Union of Pure and Applied Physics. Contact: Charles S. Sahagian (CRWB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3298.

Aurora and Airglow Conference, July 29-Aug. 9, at the Agricultural College of Norway, As, Norway. Sponsors: Office of Aerospace Research, Office of Naval Research, Defense Atomic Support Agency and the Air Force Cambridge Research Laboratories. Contact: K. W. Champion, Air Force Cambridge Research Laboratories (CRUB), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3033.

AUGUST

Second International Conference on Liquid Crystal, (dates undetermined), at Kent, Ohio. Co-sponsors: Office of Scientific Research and Kent State University. Contact: Lt. Col. E. T. Walford, Office of Aerospace Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5337.

International Federation for Information Processing (IFIP) International Congress, Aug. 5-10, at Edinburgh, Scotland. Sponsor: Office of Aerospace Research. Contact: Mrs. R. W. Swanson, Air Force Office of Scientific Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5407.

Second National Conference on Space Maintenance and Extra-Vehicular Activities, Aug. 6-8, at Las Vegas, Nev. Sponsors: Air Force Aero Propulsion Laboratory, Ling-Temco-Vought, Inc., and the National Aeronautics and Space Administration. Contact: Mr. Clodfelter (APFT), Wright-Patterson AFB, Ohio 45433, Phone (513) 357-1110, Ext. 55875.

Body Temperature Regulation in Man Symposium, Aug. 19-24, at New Haven, Conn. Sponsor: Office of

Aerospace Research. Contact: Dr. H. E. Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5041.

Twenty-Fourth International Congress of Physiological Sciences, Aug. 25-30, in Washington, D.C. Sponsor: Office of Aerospace Research. Contact: Dr. H. E. Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OX 4-5041.

EASCON '68 in Washington D.C., Sept. 9-11

"The Changing World of Electronics" will be the theme of EASCON '68 Exposition (Electronics and Aerospace Systems Convention/Exposition) to be held Sept. 9-11, 1968, at the Sheraton Park Hotel, Washington, D.C.

The three-day conference and exposition will combine technical sessions and related displays to offer a balanced program on the latest developments in aerospace electronic systems and equipment.

Sponsored by the Institute of Electrical and Electronics Engineers, the EASCON '68 Exposition will include technical sessions covering 12 major areas in the field of electronics, including communication, aeronautical, space and underwater systems.

Attendance at the technical sessions and the exposition is encouraged from Defense Department and other government agencies as well as the electronics industry. An advanced registration fee of \$1 will be charged and a \$2 entry fee will apply to government and military personnel attending the technical sessions. No registration fee will be charged for attendance at the exposition.

For further information on EASCON '68 Exposition, the contact is: Mrs. Harriet H. Manley, Page Communications Engineers, Inc., 3300 Whitehaven St. N.W., Washington, D.C. 20007, Phone (202) 337-7600.

SYSTEM DESIGN MANAGEMENT

SUPPORT MANAGEMENT

MAINTAINABILITY AND RELIABILITY

MAINTENANCE PLANNING

SUPPORT AND TEST EQUIPMENT

SUPPLY SUPPORT

TRANSPORTATION AND HANDLING

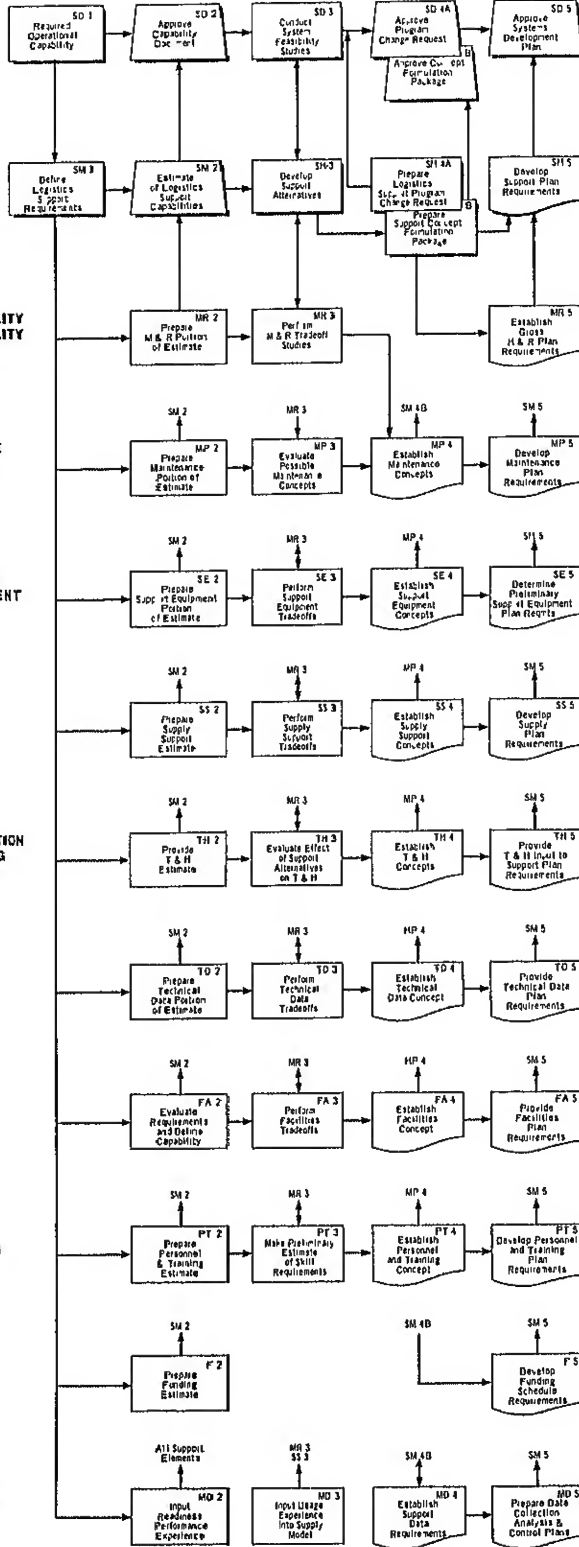
TECHNICAL DATA

FACILITIES

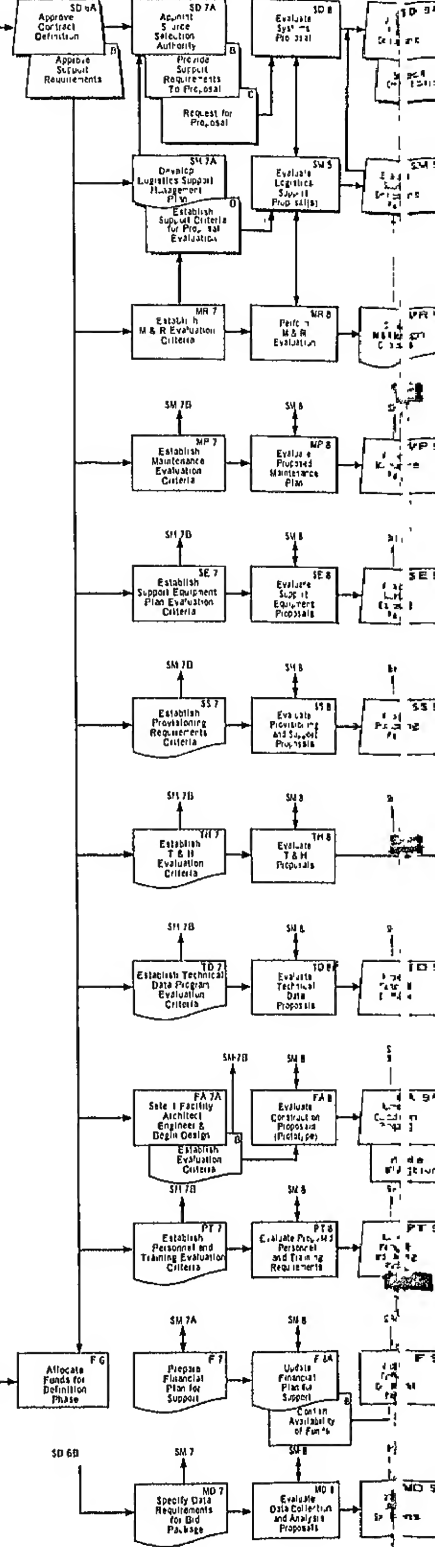
PERSONNEL AND TRAINING

FUNDING

MANAGEMENT DATA



Functional Baseline Approval and Funds Release for Contract Definition



Concept Formulation

Contract Definition

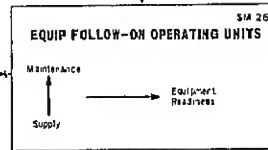
MANAGEMENT MATRIX

INTEGRATING LOGISTICS SUPPORT PLANNING EVENTS

Also show Baseline * Approval
1 Performance Specifications
A-2 PL-45 Release for Development

OPERATIONS COMMAND FUNCTIONS

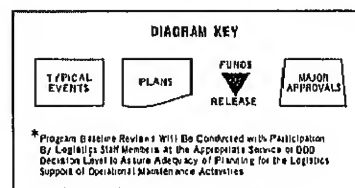
Manage Organization, Equipment, Facilities
and All related Supporting Resources to Meet
the Mission



= MISSION ACCOMPLISHED

SYSTEM/SUPPORT COMMAND FUNCTIONS

Includes the Acquisition and World Wide Technical
Management of Weapons and Equipment Systems
their Modifications, Repair and Support (Inventory)



Development

Operational



Research Reports

Authorized DOD contractors and grantees may obtain these documents without charge from
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

Others may purchase these documents at a price of \$3 each (microfiche 65¢) unless otherwise indicated, from:

Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Naval Gunfire Support. This U.S. Marine Corps manual contains information and guidance concerning the organization, command relationships, and planning considerations for naval gunfire support in amphibious operations. 1967. 171 p. il. D214.9/4:7-2/2. \$1.25.

Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E. Defense Documentation Center, Cameron Station, Alexandria, Va., March 1968, 18 p. Order No. AD-667 000.

A Summary of the State of the Art in Microfilm Document Storage and Retrieval Systems. Rome Air Development Center, Griffiss AFB, N.Y., Sept. 1967, 113 p. Order No. AD-820 127.

Oceanographic Comment on Apollo 501 Mission Photography. Texas A&M University, College Station, Tex., for the Navy, Nov. 1967, 92 p. Order No. AD-663 457.

Sixth Annual Technical Report: Expanded Research Program in Materials Sciences for Period July 1, 1966 through June 30, 1967. University of Chicago, for the Advanced Research Projects Agency, Dec. 1967, 88 p. Order No. AD-663 152.

Oxygen-Corner-Expansion Flows with Coupled Vibrational and Dissociational Nonequilibrium. University of Toronto, Canada, for the Air Force, Dec. 1967, 78 p. Order No. AD-663 244.

A Study of Penetration of a Liquid Injectant into a Supersonic Flow. Aerospace Corp., El Segundo, Calif., for the Air Force, Oct. 1967, 39 p. Order No. AD-663 417.

Impurity Photoionization Theory of Precursors. Polytechnic Institute of Brooklyn, for the Navy, Oct. 1967, 38 p. Order No. AD-663 145.

Calibration of Hot-Film Sensors in a Towing Tank and Application to Quantitative Turbulence Measurements. U.S. Naval Academy, March 1967, 55 p. Order No. AD-663 098.

A Review of Ceramic Thin Film Technology. General Precision Systems, Glendale, Calif., for the Air Force, Oct. 1967, 167 p. Order No. AD-660 590.

Preparation and Characterization of High Quality Single Crystal Refractory Metal Carbides. Westinghouse Electric Corp., Pittsburgh, Pa., for the Air Force, Oct. 1967, 77 p. Order No. AD-663 248.

GOVERNMENT PRINTING
OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

U.S. Government Organization Manual 1967-68. Presents essential information about government agencies and provides supplemental information including brief descriptions of quasi-official agencies and selected international organizations. Also lists several hundred representative publications showing the types of published materials available from Government establishments. GS 4.109:967. \$2.

Department of Defense Security Posters (size 22 x 14 inches): Do You Take Security Regulations Seriously Enough? D 7.19:5220.2. 10¢; Security is Always in Season. D 7.19:5220.3. 15¢; Let's Face It, Security is Up to You. D 7.19:5220.4. 15¢; Don't Guess, Ask Your Security Supervisor. D 7.19:5220.5. 15¢; Security Takes No

Vacation. D 7.19: 5220.6. 15¢; You Can't Pass it, Security is an Individual Responsibility. D 7.19:5220.7. 15¢.

MILSCAP, Military Standard Contract Administration Procedures. Prescribes standard procedures for use in exchanging procurement/contract administration data between purchasing offices and field contract administration offices. Basic Manual. 1967. 211 p. D 7.6/4:M59/3. \$1.25. Change 1. 1967. 78 p. D 7.6/4:M59/3/ch.1 40¢.

DOD Annual Report for FY 1965. Includes annual report of the Secretary of Defense for FY 1965, together with the reports of the Secretaries of the Army, Navy, and Air Force for the same period. 1967. 445 p. il. D1.1:965. \$1.75.

Fire Support Coordination. This U.S. Marine Corps manual provides doctrine, tactics, and techniques for the coordination of fire support during amphibious operation and subsequent operations ashore. 1967. 236 p. il. D214.9/4:7-1. \$2.50.

Defense Procurement
Circulars

Distribution of Defense Procurement Circulars is made automatically by the U. S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

Defense Procurement Circular No. 60, April 1, 1968. (1) Expiration of Deviations from ASPR and DOD Publications. (2) Relationships with Defense Contractors. (3) Use of Government-Owned Industrial Plant Equipment by Contractors. (4) Use and Charges Clause 7-702.12. (5) Index of 100 Parent Companies Which with Their Subs, etc. (6) Material Inspection and Receiving Report (MIRR) (DD 250). (7) Disposition of Post Award Audits. (8) Master List of Contractors for Negotiated Overhead Rates and Advance Agreements for Independent R&D Costs. (10) Pricing of Technical Data.



FROM THE SPEAKERS ROSTRUM

INTEGRATED LOGISTIC SUPPORT

Excerpts from address by Honorable Thomas D. Morris, Asst. Secretary of Defense (Installations and Logistics), at the Electronic Industries Assn. Symposium on Integrated Logistic Support, Washington, D. C., on March 7, 1968.

There is sharply increased emphasis on the importance of military readiness and rapid response to the support of our deployed forces, as well as on more careful management of our national resources.

Therefore, this symposium is of even greater significance than it was just a few weeks ago. I do not mean by this that we should expect to accomplish any miracles in the near future in terms of translating our dream of integrated logistic support into dramatic accomplishment. I do feel, however, that today's environment lends a new sense of urgency to our discussions, and that this should cause all of us to find creative solutions more quickly.

* * *

I think it important that we make it clear to you that in enlisting industry support of the concept that we have come to describe as "Integrated Logistic Support," we are not trying to invent a new way of forcing our contractors to assume new cost penalties or financial risks. Rather, I view our objective in this program as that of learning and applying lessons gleaned from our mutual experience in the maintenance and support of weapon systems. These lessons should teach us what actions are required during design and development in order to simplify the operation and support of our systems downstream *i.e.*, when they reach the hands of the soldier, sailor and airman, and particularly when these men are under the stress of combat.

* * *

... Those of us concerned with design, development, procurement, production, supply and maintenance must continuously keep in mind the needs of those who will operate, supply and maintain the equipment, and consciously seek to meet these needs. In preparing our cost-effectiveness analyses, we must include in the "cost side" of the equation the cost of supply, maintenance and down-time; and we must include in the "effectiveness side" of the equation the value of greater operational up-time, and longer mean-time-between-failure.

DOD Directive 4100.35, the charter for integrated logistic support (ILS), makes it clear that, in addition to a plan for the operational performance of a new system, there needs to be a companion plan for its logistic support. As development proceeds, these plans must be constantly meshed if the system is to achieve optimum effectiveness.

All of us have shared a sense of frustration in why it is proving so difficult to translate this obviously desirable and fundamental concept into reality. Our procurement people have undoubtedly shied away from proceeding too quickly because of their reticence to increase procure-

ment costs, without the ability to clearly foresee and predict the logistic economies which may emerge over the programmed life of a new weapon system. These are, of course, valid fears. The fact that the directive states that the costs of developing ILS "shall be recognized as inherent in the overall cost for delivery of an operationally effective system . . ." does not by itself alleviate these fears. I suggest that the best way to overcome this reticence is to have a convincing demonstration, by documented cases, of the costliness of our failures to apply ILS concepts; and of the values of insisting upon the proper marriage of the operational plan and the logistic support plan in new systems.

It is for this reason that I have been goading myself and my associates to seek out evidence which will be so dramatic that every skeptic among us, and among those who will be quick to criticize us, can be made a convert. I was recently furnished several examples which may be worth citing to illustrate what I hope may come out of this symposium—that is a better ability to articulate not only the benefits but, in fact, the essentiality of full application of the ILS idea.

SUPPORT SAVINGS

In one case, the airborne digital computer of the fire control system of the F-106 aircraft began requiring excessive support resources. Redesign of this 1956 state-of-the-art system resulted in estimated annual savings—in terms of maintenance man-hours and logistic support costs—in excess of \$3.5 million. The 200,000 maintenance man-hour savings annually are significant in themselves. The high cost of repair, and the obvious change in the state of the art, were



Hon. Thomas D. Morris

the motivating factors here. It would be interesting to know how many more systems are approaching this status. They would certainly seem to offer a fertile field for exploration.

In the case of the F-111, it was recognized that, because of its unique characteristics, the F-111 would benefit from a continuing analysis and evaluation of support requirements prior to completion of the engineering/design phase. Fifty-four specific design changes were made to improve equipment support and to achieve the goal of 35 maintenance man-hours per flight hour. Overall savings attributable to these improvements are almost \$92 million.

One of the design changes eliminated 250 rivets in the engine inlet shield, thereby precluding possible foreign object damage. While it may cost more to produce the revised inlet shield, the offsetting benefits in reduced repair time and increased operational time are substantial. I wonder whether more such improvements could have been conceived if logistic support had been given greater consideration during the early conceptual phase of the program.

Grumman Aircraft Engineering Corp. has reported a very interesting case based on contracts it had for two aircraft requiring carrier space—the A-6A and the E-2A. The critical manpower requirements and limited space were prime constraints. This gave Grumman the idea of designing common support equipment for the two aircraft. Perhaps we should deliberately seek to impose more such logistic restraints during the design stage in order to cause explicit consideration of the logistic support environment. The concept of common test equipment, tooling and facilities might be applied generally to aircraft support equipment, motor vehicles, items, and ships pro-

at organizational or field levels, with a sharp reduction in maintenance manpower and space requirements. This is what we are trying to achieve.

The Hawk illustration also represents the redesign of existing equipment, and the ability to incorporate new ideas based upon actual experience with a system. It would seem that redevelopment programs to extend the life of equipment between overhaul, or perhaps eliminate the need for such overhaul during its life cycle, represent a significant opportunity to conserve logistic support resources.

Another interesting development that has been taking place, particularly in the electronics industry, is the plug-in type component modules facilitating replacement in the event of failure. Obviously, the down-time of a system using such modules is negligible. This is a tremendous development that has been possible only as the state of the art has progressed through miniaturized, solid state circuitry.

These illustrations were obtained by an Industry-DOD Task Team. One can hardly look at such illustrations without wondering whether we should be seeking systems requiring "no maintenance." For example, is the possibility of a 4,000-hour "no overhaul" aircraft worth considering? What would it cost? Would the development and production costs be prohibitive, or would they be reasonable in relation to the support resources saved and the increase in hours available for operational use?

Which components of our systems should designers attack first so as to reduce support time and costs? To what extent can the "plug-in" module concept of repair now used in electronics be extended to other components?

EARLY PLANNING PAYS OFF

The pay-offs from ILS are of such magnitude that we must obviously do a more effective job of analyzing and planning at the outset of new weapon programs. In addition to stres-

sing logistic support during the conceptual and design phases, we should also be seeking more effective use of existing support facilities, equipment and resources through product improvement programs for existing major systems.

The Office of the Secretary of Defense and the Military Services are working on these and other ideas.

The Office of the Director of Defense Research and Engineering is preparing development concept papers on every major development program. These papers incorporate consideration of production and logistic support matters during the program approval process. This is a major step forward.

A task force under the Joint Logistics Chiefs is now at work on procedures to assure that logistic support arrangements for multi-Service aircraft are thoroughly considered during the design and development stage.

A document entitled, "DOD Systems and Equipment Integrated Logistic Support Planning Guide," will be reviewed with you. This guide promises to provide important procedural knowledge for DOD managers. It will be available to industry by the fall, after having been reviewed by several industry associations and the Military Services.

An Industry-DOD Integrated Logistics Support Committee is being formed. This group has been asked to work with us for the next year to further illustrate the benefits that can be achieved through ILS, and to develop recommendations affecting the contractor-customer interface. We expect much from this group.

In conclusion, I wish to pay my compliments to the many members of industry who have already assisted us in making progress in this field. I assure you that it is the objective of those of us in the Office of the Secretary of Defense and in the Military Services to act upon the results of this work and to foster continued efforts with industry. In summary, we need no more authority and directives to hasten our progress, but we do need greater understanding on the part of all concerned, and practical proof of what can be accomplished.

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INTEGRATED LOGISTIC SUPPORT— ITS NECESSITY AND ACCOMPLISHMENT

Address by Dr. Finn J. Larsen, Principal Dep. Dir. of Defense Research and Engineering, at the Electronic Industries Assn. Symposium on Integrated Logistic Support, Washington, D.C., March 7, 1968.

I have been asked to consider integrated logistic support (ILS) from a research and development viewpoint. I should like to do so in light of our experience in Vietnam as well.

We, both Government and industry, have been making progress during recent years in the reliability, maintainability and logistic support aspects of the equipment and systems that are developed for service use. The Vietnam war has provided even greater emphasis to these efforts. As we consider the tactics used in Vietnam or compare our forces with the enemy's, we come to the conclusion that our soldiers, marines and airmen are increasingly dependent on equipment, much of which is quite complex.

Fortunately, it is not our policy to meet the Viet Cong on a man-for-man basis. Our philosophy is to make use of superior firepower, sophisticated equipment, better machines, insofar as this is possible. Electronic intrusion devices, complex aircraft with multi-purpose avionic systems—even our combat boots are specially designed rather than being sneakers—all these are in everyday use by our forces in Southeast Asia. We are trying to use technical superiority and industrial might, rather than numbers of men to win our battles.

I am not detracting from the American soldier. As always his skill, initiative and valor make him one of the finest soldiers in the world. Our function—yours and mine—is to amplify every soldier by giving him the equipment that makes him superior to several enemies, not just one.

It is evident from statistics on the ratio of enemy battle losses to ours—five to one or better—that this policy of reliance on equipment is sound. But the enemy is not standing still. Recently he, too, has begun to use more sophisticated devices. Witness his use of armor recently in the Lang Vei area, and again near Saigon.

Our reliance on sophisticated equipment, rather than sheer manpower, emphasizes the necessity for good logistic planning, and places real importance on the integration of logistic considerations in the design process. Maximum reliance on equipment dictates an even greater responsibility than ever before for better maintainability, greater reliability, and more effective logistic support. Our weapon systems and equipment are of no value unless they are ready for use when needed. Equipment must not only have excellent performance when it is operating, but it must operate without failure. Those of us in Government believe that the way to achieve good supportability and economy is by considering logistics early and assuring that the basic hardware, the support equipments, the personnel and training, the technical data—the whole system—has logistic considerations designed into it.

Balance Performance, Logistics

In the not too distant past, our systems and equipments were designed primarily to achieve operational performance—"pure" performance characteristics, such as range, speed and payload. These are still vitally important in attaining superiority. But

logistic aspects were often considered after the design was so far along that significant changes could not be made. In some instances, designs have resulted in severe logistic penalties. We have recognized that the emphasis was too far in the direction of operational performance. We are now emphasizing logistic considerations, not with the intention of swinging completely in the other direction—maximum consideration of logistics and inadequate consideration of operational performance—but rather to achieve a proper balance. In order to achieve that balance, it is necessary to consider early in the design process all aspects of performance, logistics and economics which establish the performance and logistic standards and, through judgment and trade-off analysis, to set the proper balance.

In reading DOD Directive 4100.35, it is evident that the architects of the integrated logistic support concept mean "integrated." They mean integration of the various elements of support—personnel, technical data, support equipment, spares, etc. To a member of the research and development community, it may be more appropriate to speak of I²LS—a reiterative integration—rather than ILS. The first integration is that definitely intended by the authors. The second integration is the integration of logistic considerations in the design process. Unless logistics is an inherent part of the design process, and logistics is designed into the product, major logistic problems will continue to plague us.

We have recently completed a study of manpower-equipment considerations. How do we achieve the proper balance between the use of men and equipment? How do we obtain the best interface between them? We concluded that the only effective way to accomplish our goals is to ensure adequate consideration of manpower factors early in the development, to make trade-off studies during the conceptual and contract definition phases, and to integrate the results in the design process. Logistic aspects are identical to man-machine problems in this respect. The key to adequate logistic support is to integrate the logistic requirements into the design process—to plug it into systems engineering.



Dr. Finn J. Larsen

ILS Policies

Let us examine our ILS accomplishments, our policies, and the direction of our progress. Let me give you some specifics. We have in being a number of policies and practices that promote improved logistic support; for example, the concept formulation/contract definition policies enunciated by DOD Directive 3200.9. It is clearly the intent of these policies that logistics be considered early in the conceptual stages, and that logistics be a major factor in contract definition and development. One prerequisite of engineering development is that the remainder of a program be engineering rather than research—that the technology be well in hand before an engineering or operational systems development program is launched. This prerequisite is aimed at a number of objectives including the prevention of major logistic support problems. Another fundamental aspect of the concept formulation/contract definition policy is that system trade-offs be made. I quote:

"Trade-offs should be used to obtain, with the mission and performance envelopes, an optimum balance between total cost, schedule, and operational effectiveness for the system. In this context, . . . operational effectiveness includes all factors influencing effectiveness in operational use (such as 'pure' performance, reliability and maintainability); and system includes the hardware itself and all other required items; such as facilities, personnel, data, training equipment, etc."

The current policy of the Director of Defense Research and Engineering on reporting of major developments (outlined in DOD Instruction 3200.6) provides for Technical Development Plans (TDP) and requires that the plans include:

- Operational information that affects reliability and maintainability design.
- Planning information needed for reliability and maintainability design.
- Plans for a reliability program outlining how reliability will be achieved.
- Plans for a maintainability pro-

gram outlining how maintainability will be achieved.

Quantitative information on characteristics, such as turn-around time, planned utilization rate, mean-time to return to service, and minimum allowable time between scheduled maintenance, is also expected to be provided in the TDP.

The DOD policy on System Project Management (DOD Directive 5010-14) references the ILS directive (4100.35) and states:

"Logistic support planning shall be accomplished concurrently with other system/project effort. The logistics organizations identified in the System/Project Manager Charter and in the approved, negotiated System/Project Master Plan will assist the System/Project Manager in support planning and in developing transition agreements."

The Office of the Director of Defense Research and Engineering has actively engaged in the generation of several DOD standards that promote more effective logistic support. These include Mil-Standards 470, 471 and 785 dealing with maintainability program requirements, maintainability demonstration, and a reliability program.

There are several other recent policies and practices that we have been working on in cooperation with the Assistant Secretary of Defense (Installation and Logistics) and his staff: total package procurement and life-cycle costing. I believe that these will focus more attention on the logistic aspects and will help in achieving better logistics support. In mentioning total package procurement, may I insert a word of caution about its application. Total package procurement is not the appropriate method for procuring all major items. It was an excellent choice for the C-5A because of its relative simplicity and the fact that its design was within the state of the art. Total package procurement is not a good choice for an advanced, complex aircraft.

In the list of policies and practices that currently exist, I want to mention a very important directive. This is the DOD policy on the use of microelectronics in military equipment and systems. This policy requires that all new projects in advanced, engineering and operational

systems development "consider the use of microelectronics technology in their design . . . with the view of maximizing reliability and minimizing total cost of ownership . . ." That policy is expected to have a major impact on maintenance and logistic support. Throughout this policy, concepts such as "module discard-on-failure" and "logistics self support" will be used much more extensively. I am confident that increased use of microelectronics will result in major improvements in both operational performance and in logistics effectiveness.

We have been talking about policies that will lead to improved logistics. How have these policies worked? Have they reduced or simplified maintenance, reduced personnel, or training requirements, or improved some other aspect of logistics? A good and very recent example of the effect of these policies is the Fast Deployment Logistic (FDL) Ship contract definition in which there was great emphasis on life-cycle costs and cost effectiveness. During contract definition, the civilian crew requirements were reduced from 52 men to 37 per ship as a result of trade-off studies to optimize the complete ship system for its anticipated life.

An example of the results that can be achieved in hardware design is the C-5A landing gear. During the course of the landing gear design there were a number of decisions made that clearly will improve logistics. For example, an initial design approach to the kneeling mechanism was a complex series of spur and worm gears. Under the pressures of the total package contract to provide lighter weight and more reliability, the design was changed to a very simple chain drive actuated by an air motor. It is expected that reliability and maintainability will both be improved and the number of spares procured will be reduced. Another decision during the landing gear design was to scrap a concept that would have made wheel removal difficult and go to an entirely new design. This was a major and expensive change that will improve C-5A supportability. Another example in the same aircraft is the change from conventional mechanical couplings in the hydraulic lines to sleeve welding. The welding creates a more leakproof joint over the lifetime of the aircraft and will reduce maintenance.

Where ILS Is Going

Let us consider the second part of the topic—what is our direction? I believe that there are several activities that the Office of the Director of Defense Research and Engineering is working on to improve the effectiveness of logistic support:

- A policy on systems engineering.
- A policy on configuration management.
- A policy on reporting of major development programs including requirements for Technical Development Plans.

A Work Breakdown Structure (WBS) policy and standard currently under consideration recognizes the importance of ILS by accommodating the elements of ILS in the Summary Work Breakdown Structure. However, in line with our desire to integrate logistic planning and requirements in the design process, ILS has not been made a separate item in the WBS. Rather the individual ILS elements are expected to be accommodated in WBS elements, such as system engineering, common support equipment, peculiar support equipment, data, training, etc.

With regard to system engineering, we are attempting to develop output-oriented (*i.e.*, not proceduralized) systems engineering practices. It is intended that these practices be applied in procurement to insure a completely integrated engineering effort including the integration, by the contractor, of all the support factors (logistics, human factors, etc.). The objective is to adequately consider logistic support factors during system engineering and design.

Our policy on configuration management will provide a maximum degree of design and development latitude, yet introduce at the appropriate time the degree and depth of control necessary for production and logistic support. We believe that these configuration management policies and practices will result in the following benefits to logistic support effort:

- Fewer changes will occur because of more stringent criteria for evaluating proposed changes, including the impact of all aspects of a proposed change on logistics.

- Changes to improve logistics will be emphasized since one kind of change permitted is that which significantly improves logistic support.

- Better knowledge and visibility of the configuration.

- More orderly implementation of all aspects of an approved change, including technical data, training, etc.

There have been significant problems in the past when an engineering change was approved and implemented for the prime mission equipment without accompanying changes in handbooks, test equipment, training, etc.

We are considering a number of changes in the DOD policy on reporting of major development programs that currently require a Technical Development Plan. Of special interest is a proposed change to require reference to an Integrated Logistic Support Plan (if there is one), and inclusion in a quarterly report on the status of the project, a qualitative rating of four areas: operational and technical, financial, schedule, and logistics. I believe that this will be the first time that a status report on development will put logistics on a equal footing with these other factors.

After having discussed the status and direction of programs related to ILS, let me emphasize a few additional points:

First, on each major program, we need to establish a working relationship between the logisticians (including maintenance engineers) and the analysts and designers. And we need to do it early in development.

If the logisticians generate a logistic concept and follow this by a statement of tentative logistic requirements, the designers and analysts can enter into the trade-off studies and analyses that are made in the conceptual phase of development. An early consideration of logistics, and continuing consideration during the development, should achieve the proper balance between operational, economic and logistic factors that is our goal.

Second, we need better data and better tools for an early assessment of the logistic impact. We can do reasonably well in estimating opera-

tional performance ("pure" performance), development costs and, to a lesser extent, production costs. However, our ability to estimate operational and maintenance consequences, including their costs, is very poor. Related to this is the need to evaluate proposals and make selections by considering the total program, including logistics.

Thirdly, we need to write contracts that motivate the contractor to optimize the total system and total costs. One approach is total package procurement. We will use it when it is appropriate. To establish motivation, figures of merit or total program measures of effectiveness are needed. An example is the measure used for the FDL ship:

$$\frac{\text{speed} \times \text{payload}}{\text{life cycle costs.}}$$

Lastly, we must train and use logisticians. They must work with the analysts and designers, and must participate in the review of the development program as it progresses.

I want to emphasize a point on which there may be some differences of opinion between the logisticians and developers. We in research and development believe that the way to get better logistic support is not through a large independent organization that is concerned with ILS, but rather by assuring that the program manager has within his organization the required logisticians. We believe that achievement of integrated logistic support is dependent upon integration of logistic considerations and logistic planning into current organizations and activities, particularly the systems engineering process.

In summary, the Office of the Director of Defense Research and Engineering strongly supports the need for integrated logistic support. We believe that effective logistic support can be achieved by early and extensive cooperation between the designers and the logisticians. When the designers and the logisticians make program decisions based on the full military and economic consequences of their actions, the result will be superior force effectiveness. Our fighting men will have weapons that will be effective on the day they are fielded and every day thereafter.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

George McKee Elsey has been appointed Special Asst. to the Secretary and Dep. Secretary of Defense succeeding John M. Steadman, who became the General Counsel for the Air Force.

Richard C. Solibakke has been appointed Chairman of the Armed Services Board of Contract Appeals. The appointment was made pursuant to the Board's charter by the Asst. Secretary of Defense (Installations and Logistics) and the Asst. Secretaries of the Military Departments responsible for procurement.

Ronald A. Moser has been appointed to the newly-created position of Special Staff Asst. to the Dir., Armed Forces Radiobiology Research Institute, Defense Atomic Support Agency, Bethesda, Md.

Melvin H. Baker has succeeded Don R. Brazier as Comptroller at Defense Supply Agency Headquarters.

Capt. Shannon D. Cramer Jr., USN, selected for promotion to rear admiral, has been named military assistant to the Asst. Secretary of Defense (Public Affairs).

DEPARTMENT OF THE ARMY

Maj. Gen. Paul A. Feyereisen, Program/Project Manager for the MAL-LARD Project, and Dep. Command General of the Army Electronics Command for Tactical Communication Systems, Fort Monmouth, N.J., was promoted to his present rank on April 1.

William K. Brehm has been sworn in as Asst. Secretary of the Army for Manpower and Reserve Affairs.

Brig. Gen. Felix J. Gerace has been appointed Commanding General of the U.S. Army Natick Laboratories, Natick, Mass.

The U.S. Army Weapons Command, Rock Island, Ill., has appointed the following new commodity managers:

Maj. Andrew C. Johnson, armament systems for the AH-1G (Huey Cobra) helicopter; Lt. Gary A. Eberhardt, armament systems for the UH-1B, C and D helicopters; K. Jay Leonard, OH-6A, OH-13, OH-23, and CH-47 helicopters; Wayne A. Uchterff, automatic guns and grenade launchers (aircraft); and Albert D. Hass, armament systems for the AH-56A (Cheyenne) helicopter.

DEPARTMENT OF THE NAVY

RAdm. Jack J. Appleby, SC, Dep. Commandant of the Industrial College of the Armed Forces has been named Commanding Officer, Naval Supply Center, Oakland, Calif.

RAdm. John W. Bottoms, SC, Executive Dir., Supply Operations, Defense Supply Agency, has been named Commanding Officer, Naval Supply Center, Norfolk, Va.

RAdm. Lucien B. McDonald, former Commander, Military Sea Transportation Service, Far East, has been assigned as Dep. Chief of Staff for Logistics and Management, Commander-in-Chief, U.S. Atlantic Fleet.

RAdm. Walter F. Schlech Jr., has been selected as Commandant, Military Sea Transportation Service, Atlantic.

The following captain assignments have been announced by the Chief of the Bureau of Naval Personnel:

Capt. William W. Barrow, CEC, Commanding Officer, Naval Public Works Center, Newport, R.I.

Capt. Stuart J. Evans, SC, Officer-in-Charge, Navy Purchasing Office, Los Angeles, Calif.

Capt. Harmon R. Joy, Commanding Officer, Naval Ordnance Station, Louisville, Ky.

Capt. William A. Johannesen, SC, Commanding Officer, Naval Supply Depot, Guam.

Capt. Richard P. Pawson, SC, Officer-in-Charge, Navy Purchasing Office, Alexandria, Va.

DEPARTMENT OF THE AIR FORCE

J. William Doolittle has been sworn in as Asst. Secretary of the Air Force for Manpower and Reserve Affairs.

Maj. Gen. Guy H. Goddard has been named Dir. of Civil Engineering, Office of Dep. Chief of Staff (Programs and Resources), succeeding Maj. Gen. Robert H. Curtin, who retired April 30.

The following assignments have been made in the Air Force Logistics Command (AFLC):

Lt. Gen. Jack G. Merrell, Commander, Air Force Logistics Command, with promotion to rank of general; Brig. Gen. Robert A. Berman, Asst. Dep. Chief of Staff (Maintenance Engineering), AFLC Hq.; Brig. Gen. John French, Dep. Chief of Staff (Comptroller), AFLC Hq.; Col. Lester T. David, Dir. of Operations Systems, Advanced Logistics Center, Wright-Patterson AFB, Ohio; Col. Rufus H. Nowell Jr., Chief, Aircraft and Engine Procurement Div., Oklahoma City Air Materiel Area, Tinker AFB, Okla.; Col. Joseph E. Stiles, Dir. of Advanced Systems, Advanced Logistics Systems Center, Wright-Patterson AFB, Ohio; and Col. John R. Gibbons, Dir. of Procurement and Production, Oklahoma City Air Materiel Area, Tinker AFB, Okla.

The following assignments have been made in the Air Force Systems Command (AFSC):

Col. Franklin K. Boosembark, Chief, Range Contract Office, Air Force Western Test Range, Vandenberg AFB, Calif.; Col. Robert P. Daly, Dep. for Development Planning, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; Col. James H. Hall, Dep., Systems Engineering Minuteman, Space and Missile Systems Organization, Norton AFB, Calif.; Col. Gerald K. Hendricks, Chief, Advance Programs F-111, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; and Col. Joseph W. Rogers, Asst. Test Dir., Air Force Flight Test Center, Edwards AFB, Calif.

Project Transition

A Path to a Productive Career

Frank M. McKernan

In April 1967, in his Manpower Report to Congress, President Johnson stated, "We must make military service a path to productive careers." He then requested the Secretary of Defense to establish a program for servicemen "to make available, to the maximum extent possible, in-service training and educational opportunities that will increase their chances for employment in civilian life."

Project Transition is the program set up by DOD with the cooperation of American industry and labor, and other Federal agencies to take care of this problem.

Each year more than 750,000 enlisted men and women return to civilian life from the Military Services. Many of these young men and women return to former civilian employment or go to college. However, many do not have jobs or college plans, or were unable to obtain a civilian related skill while serving in infantry, artillery, armor, or other combat or combat support duties. These people are the ones who need help in finding gainful employment.

Project Transition, although established by DOD, is not solely a Defense Department program; it is a cooperative effort with the private sector of our economy. It needs the active participation of business, industry and labor to make it work.

Basically Project Transition works like this: The Military Services will counsel the men during their last six months in service, and will make them available for training as needed. On the private industry, labor union, or local government side of the program is the actual training and hiring of men who are soon to be veterans.

For their part, the Military Services provide a pool of manpower that

has several superior attributes. The veteran is older (average age of 22 years) and more mature than recent high school graduates. He is accustomed to accepting responsibility and has learned the benefits of discipline. He has been proved trainable. The veteran is mobile; he is usually willing and able to travel to a new home for employment. He is in good physical condition, unless he is one of the few who has suffered handicapping war injury. And, most important to a civilian employer, he has finished his active military obligation.

Under the Transition program, counselors at 205 posts and bases will interview enlisted personnel about six months prior to their separations from service to determine their aptitudes, interests and future prospects. To assist them the counselors have the results of Service-administered

tests, Service records, notices of job opportunities and skill requirements. Counselors receive these notices of job opportunities and lists of skill shortages throughout the country from the U.S. Employment Service (USES) and from local, regional and nation-wide companies.

At the minimum, counselors will assist men with saleable civilian skills in preparing resumes and in locating jobs. Under a full Project Transition program, the Services make the men, who need civilian skills, available for training by industry, trade associations, labor unions, or local governments, Manpower Development and Training Act (MDTA) courses, or within existing military training programs. The Services continue to shoulder all the costs usually associated with employment and personal maintenance—pay, food and housing. Many local bases will also transport men reasonable distances to established industrial training facilities, or to public or private vocational schools. In some instances, the local military base may be able to provide classrooms right on base.

In certain cases the Services will use vacancies in their own courses to teach civilian-related skills, such as data processing, to men in Project Transition, or utilize the on-the-job training facilities of the base engineer, communications, or utilities shops. Correspondence courses of the Services and the U.S. Armed Forces Institute, and group study classes are already being used to fill gaps in Transition trainees' educational backgrounds (especially in bringing them up to the equivalency of high school completion), or to teach collateral skills, such as arithmetic or geometry, to those men already skilled in vocations.



Frank M. McKernan is Director of Project Transition in the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs). He was educated at the University of Cincinnati, University of Wisconsin and the Graduate Institute of International Studies, Geneva.

So far, with pilot program experience behind them, the Transition staff has found warm reception to the program by both industry and the men in the Services. As the word gets out, more companies, businesses, associations, labor unions and local government agencies are requesting information on how to start Transition training programs. Since the program was inaugurated nation-wide in January 1968, industry is already supporting training for such areas as service station managers, TV servicemen, automobile mechanics, heavy equipment operators, office machine servicemen, data processing equipment servicemen, marine pipefitters, and computer programmers.

Transition training courses can be established under the MDTA, through the cooperation of the Department of Labor and the U.S. Office of Education. These MDTA courses would conform to state educational criteria and would be administered by appropriate state agencies, but would require no state matching funds. DOD desires to use this training route at military installations where industry cannot provide training in order to balance out training opportunities.

The first five MDTA courses were established in Louisville, Ky., in the Fort Knox pilot program. Four of these courses (small appliance repair, welding, industrial electricity and automobile mechanics) are taught in the local school system's vocational education facilities; automatic data processing is operated by a private school.

Prospective employers interested in hiring veterans can tap the Project Transition manpower pool through their local U.S. Employment Service offices and through the Transition counseling program. While the DOD still has a policy which prohibits direct recruiting on a military base, Transition does afford companies an opportunity to make their needs known by furnishing information to the counselors.

Business, associations, labor unions, or local governments can participate in Project Transition under three plans. The first involves actual job training by industry or Government for vacant jobs. Under this plan, the company, association, union,

or local government would furnish everything needed for training—materials, equipment, instructional program and instructor. The products of this program, trained under the standards of the company, are then available for employment with that company. Under this plan, training opportunities are opened to many deserving servicemen, and in turn, with some venture in funds, a company obtains valuable additions to its work force, trained under its own program.

Under the second plan, the company, association, union, or local government notifies the Defense Department of training opportunities for servicemen after their separation. Information about training opportunities would be circulated to Transition project officers at the 205 participating military installations for use in counseling. This plan would be appropriate when the training is not of the type that can be given while the man is in service, or when the training facilities are not located near a base, or when the man has too little active duty time remaining to complete the instruction.

The third plan involves making available to industry men who are already skilled as a result of either military or prior civilian experience. While the first plan, complete training of the unskilled, is the prime program, the Defense Department recognizes that there are many men whose skills can be used immediately by industry. Through counseling, the Department tries to help skilled servicemen find immediate employment commensurate with their skills and potential.

Proposals for Transition training programs may be forwarded to the Transition staff in Washington, and should contain the following information:

- Nomination for locations of training near military bases.
- Facilities where training would actually be conducted—on the military installation, at a plant site, in a training school, or a combination of places.
- Courses proposed.
- Length of courses—hours and weeks, with a basis of four hours instruction per day, five days a week.
- Methods of instruction.
- Buildings or facilities needed, if on a base or post.
- General summary of course content.

• Jobs to which courses lead and general salary range.

• Selection instructions for counselors to use when screening applications for the courses. This would include company employment standards or general employment policies. Of course, employment and training must be open on an equal opportunity basis with respect to race, creed, or religion.

• Number of trainees per class.

• Locations where jobs will be available.

• Any other information which will amplify the proposal.

Proposals or other queries about Project Transition should be addressed to: Director, Project Transition, Office of Assistant Secretary of Defense (Manpower and Reserve Affairs), The Pentagon, Washington, D. C. 20301.

Containerization Office Established at MTMTS

A new office has been established within the Military Traffic Management and Terminal Service (MTMTS) to serve as a coordinating point with DOD, single manager transportation agencies, industry and other agencies having an interest in containerization.

MTMTS' Office of Project Manager for Containerization will be headed by Lieutenant Colonel C. R. Breining Jr., USA. He will be assisted by John Warren, an experienced transportation official, who was formerly assigned to the Water Export Control Division of MTMTS Freight Traffic Directorate.

Uniform Quality Levels Tightened by DSA

The Defense Supply Agency has announced a tightening of the acceptable quality levels for procurement of Class A military uniform items, and an increase in the inspection levels used for sampling inspections.

As a result, the contractor and the Government will be looking at a larger number of sample units to determine acceptability of lots offered for purchase. Quality standards will also be sharpened.

The change will apply to all future procurements of such uniform items as dress coats, trousers, overcoats, caps, Navy jumpers, and raincoats.

U.S. Army Munitions Command Continues Emphasis on RDT&E

G. F. Chesnov

At the time of the Army reorganization of command structure in August 1962, the U.S. Army Munitions Command was established as one of the seven major subordinate commands of the Army Materiel Command (AMC).

The Munitions Command, with headquarters at Picatinny Arsenal, Dover, N.J., is one of the most complex of all the AMC subordinate commands and activities by virtue of size and diversification of programs and commodities. Its mission responsibility of integrated management for the life cycle of munitions encompasses research, exploratory development, commodity development, design and engineering, procurement, production, supply and maintenance, and disposal. The commodities for which the command is responsible include nuclear and non-nuclear ammunition, rocket and missile warhead sections, chemical and biological materiel, pyrotechnics, and propellant actuated devices.

The mission is carried out through five major agencies, four of which (called commodity centers) are Edgewood Arsenal, Edgewood, Md.; Fort Detrick, Frederick, Md.; Frankford Arsenal, Philadelphia, Pa.; and Picatinny Arsenal at Dover, N.J. The fifth organization, the Ammunition Procurement and Supply Agency, manages the bulk of commodity manufacturing and loading plants and is the national inventory control point and the maintenance management center for the command. The mid-management responsibility for the overall commodity management program resides within the headquarters of the Munitions Command on the site of Picatinny Arsenal.

Planning for the successful accomplishment of the U.S. Army Munitions Command program is essentially no different from that of industry. Although the success of in-

dustry in the civilian consumer market is measured simply by profit, the process of profit making is far from simple, as many insolvents have learned to their sorrow. In spite of the unexpected "bad breaks" imposed by unpredictable political, economic and social instabilities and fluctuations in our free enterprise system, industry has learned that continued emphasis on planning is essential to staying on top.

Planning in the Munitions Command involves such factors as market assessment and stimulation, research for product improvement and innovation, engineering, development, product evaluation, production and distribution. The criterion for measuring its success cannot be financial gain. It is, rather, the ultimate strength of the Army's stockpile of weapons and firepower. Because the superiority of this stockpile contributes immeasurably to the nation's security, the state of bankruptcy may not be tolerated. Continued emphasis on research, development, test and evaluation (RDT&E) planning is indeed mandatory in the munitions business.

The Backbone of Weapons RDT&E Effort

The two most significant categories of effort in the RDT&E program are research and exploratory development. It is through the careful management planning of these programs that the U.S. taxpayer's defense and security are assured. Together, the research and exploratory development programs constitute the technological

base for advanced weapon systems designs, designs which are optimized for performance under the most adverse and complex battlefield conditions of today, and of those postulated for the future. The fruit of these programs provides the understanding and technology for the synthesis of better materials, components, and advanced concepts which lead to systems with greater reliability and effectiveness, greater ease and safety of employment, and which require minimal maintenance in the field.

Policy—Management's Frame of Reference

As in most large and complex research and development organizations, the organization of the Army Munitions Command consists of managers with wide ranging ideas on how to plan, conduct and measure work. While such diversity is healthy and is to be encouraged, it may also, if unchanneled, degrade the productivity of research and exploratory development.

It was not too long ago that the term "research" covered the complete spectrum of scientific and engineering investigation, from study of interatomic forces to the breadboarding of prototype fuzes. Although attempts at semantic differentiation were made, the concepts of management appeared the same for the entire spectrum. Consequently there existed classic examples of applied engineering research being protected within ivory tower environments, and fundamental or basic research being placed under development type controls, depending on the background of the laboratory director.

Since a distinction is now made between research and exploratory development, policy for these quite separate activities must be differentiated. Such policy must reflect an

About the Author—

G. F. Chesnov is a physical scientist serving with the Research Division of the Research, Development and Engineering Directorate at Army Munitions Command Headquarters.

understanding of research and exploratory development. It must also provide a frame of reference wherein management may encourage the successful conduct of fruitful effort within each of the two programs.

Organization for Mid-Management

Based on the premise that its research and exploratory development program needs to be nourished by special management concepts and managed by scientist-managers, the Munitions Command organized the Research Division within the Research, Development and Engineering Directorate of its headquarters. The division is charged with the formulation of policies, practices and technical programs of research and exploratory development and, thereby, will:

- Insure and encourage the pursuit of fundamental knowledge in the sciences to achieve a balanced spectrum of technical effort and disciplines of relevance to the command's basic missions and interests.

- Insure that the exploratory development program is directed toward solution of specific military problems, and that the necessary work is done, from time-oriented research to advanced breadboard hardware, to provide a firm technical foundation for the engineering development of end items in the nuclear, non-nuclear, chemical and biological areas.

The Research Division is staffed with scientists and engineers having bench experience, an appreciation for the trials of the laboratory, and an understanding of the problems of administration. It is their job to plan, establish and implement the policies that will produce good work.

Policy Planning for Research

In Army Regulation 705-5, research is considered to constitute all effort directed toward increased knowledge of natural phenomena and environment, and efforts directed toward solving problems in the physical, behavioral and social sciences. These problems may not necessarily have direct military application, but their solutions will provide the basic understanding required to solve problems of military importance.

Research, being indefensible on the basis of immediate payoff, requires a policy accepting it on its own terms,

or at least consistent with its definition. An important function of research policy is to protect the researcher from the type of technical manager whose objective is to legislate and program scientific discovery. On the other hand such policy should call for quality researchers, quality output, and a sincere attempt to communicate knowledge and understanding in support of the military mission.

The Munitions Command research program, as indicated by Figure 1, constitutes effort in the defense research sciences, including work in the functional areas (in direct support of commodity materiel), i.e., research in explosives, propellants, pyrotechnics, and the life sciences. This research effort, on which more than \$5 million was spent in FY 1967, is apportioned among the Munitions Command laboratories. It is in the interest of furthering these programs that the agencies will plan within the following "frame of reference:"

- The nature of effort is geared to understanding basic or fundamental phenomena, related to command mission and/or materiel when possible.

- Categorical forecasts of task or project completion and positive results are difficult, if not impossible to make, although certain logical experiments/analyses may be scheduled with considerable tolerance and management flexibility.

- Costs of completing proposed work may not be forecast accurately, since research is identified with "level of effort" or required manhours.

- The principal investigator proposing to do the research must be a qualified research scientist with demonstrated ability.

- Where applicable, every effort must be made to convey needed information to those in exploratory development and commodity development areas.

The Balanced Research Program.

The term "balanced research program," as it applies to the spectrum of effort in the RDT&E program of any commodity command, represents management's best judgment on the distribution of resources among the disciplines. Because this distribution is determined subjectively, it is controversial and always open to challenge, and it requires continual justification. A commodity command cannot establish a research program as an end in itself. This is a luxury only educational institutions may afford, whose principal mission is the scientific development of student and faculty via philanthropies and grants. The strength of a research program in the Munitions Command is determined primarily by its ability to serve the information needs of its commodities. This philosophy dictates that the distribution of resources in the research program must be biased, e.g., that there be twice as many physicists as chemists, and half as many mathematicians as metallurgists within the total budget.

The retention of research scientists in a commodity command is based also on the need for having an advisory staff available to the engineering staff. This, too, may influence the distribution of research effort.

The advent of sophisticated enemy munitions systems, and the progressively increasing requirements of our own, have clearly indicated greater demands on weapon materials for

RESEARCH PROGRAM

DEFENSE RESEARCH SCIENCES

Physics
Chemistry

Mathematics
Quantum Electronics
Mechanics
Materials
Explosives and Pyrotechnics
Gun Propellants
Life Sciences—Chemical
Life Sciences—Biological

PARTICIPATING MUNITIONS COMMAND AGENCIES

Frankford and Picatinny Arsenals
Edgewood, Frankford and Picatinny Arsenals
Frankford and Picatinny Arsenals
Frankford and Picatinny Arsenals
Frankford and Picatinny Arsenals
Picatinny Arsenal
Frankford and Picatinny Arsenals
Edgewood Arsenal
Fort Detrick

Figure 1.

the future. These materials must perform effectively as intended, and survive unprecedented battlefield conditions and environments. For this reason the job of long range planning is the continuous appraisal of the postulated threat, the determination of associated knowledge gaps in our technology, and the ultimate balance needed in the research program. An excerpt from the Munitions Command regulation, concerning long range technical planning, states: "The long range plan for basic research will usually relate only to the general areas in which the research will be performed. It will show new directions in which the laboratory is expecting to move or old directions to be decreased or eliminated. It will serve as a guide to the types of new personnel that will be required and as a guide to training of current employees."

One might argue that once a government in-house laboratory research program is achieved, it is rigidly fixed and not subject to change because:

- Federal Civil Service regulations on personnel policies and practices limit technical management's response time to changing requirements.
- Most highly qualified research investigators have a high degree of specialized interest in comparatively narrow fields, and may not want, or be able, to change readily to related or other fields.

Without appropriate controls, it is conceivable that a research program, due to preferences of the scientific staff, may tend to be self-perpetuating. Management does, however,

have four strong measures to prevent this from happening. These are:

- Scientist exchange programs.
- Retraining and post-doctoral educational programs.
- Industrial and academic institutional support.
- Selective hiring into positions which are vacated by normal attrition.

Unless planning has been poor, there is seldom a need for rapid change in the research program. In general, the use of the four approaches mentioned has proved adequate to accommodate changing needs, as determined by long range planning.

Planning for Training.

Recognizing the need for continual stimulation of planning for training programs, Major General Floyd A. Hansen, former Commanding General of the U.S. Army Munitions Command, in a letter to his research and development agencies, dated Jan. 13, 1967, stated, "It is my desire that each installation of the Munitions Command establish a positive program for the continued education of scientific and engineering personnel, directed toward updating the knowledge of scientists and engineers to keep them abreast of scientific and technological advances." The guidance set forth by the Commanding General included enrollment at local colleges and universities; participation in the National Academy of Sciences Post-Doctoral Research Associateship Program for both junior and senior post-doctorals; exchange of scientific and engineering personnel with those engaged in research

and development activities at other DOD laboratories; and scientist exchange assignments with foreign laboratories. The request also included an assessment of the current status of the scientific and engineering training and development programs of the command's laboratories, and the development of a "planned and time-phased program, over a period of two to five years for accomplishment of such needed training."

In addition to contracts and grants to assist government laboratories in maintaining a dynamic program, the Defense Department set a pace for its agencies with a plan called Project THEMIS. This plan is intended to strengthen the scientific and engineering capabilities of the nation's higher academic institutions and, thereby, enhance the research capability relating to the national defense. For those academic institutions meeting the eligibility criteria for participation in the project, research in these institutions is supported on a program basis, rather than through small contracts and grants. Project THEMIS has the effect of complementing the in-house government research capability through mutual university-defense laboratory cooperative efforts and greater technical communications. This program is an example of thorough policy planning with regard to our nation's scientific resources.

Facilities and Equipment Planning.

One of the more difficult aspects of RDT&E planning is providing a basis for acquiring facilities and equipment to satisfy program needs. Sharply rising costs have made it necessary to screen requests very carefully for long range need and payoff. Because of the limited defense budget for capital expenditures, the Army simply cannot afford a nuclear reactor in every backyard. In recent years, instrumentation technology has improved so rapidly that expensive equipment very quickly becomes outmoded and obsolete. While any competent scientist will strive to improve the accuracy or speed of his measurements, management must keep things in proper perspective. Requirements submitted for new equipment and facilities must be entertained openly, but must be soberly evaluated against such considerations as the adequacy of existing

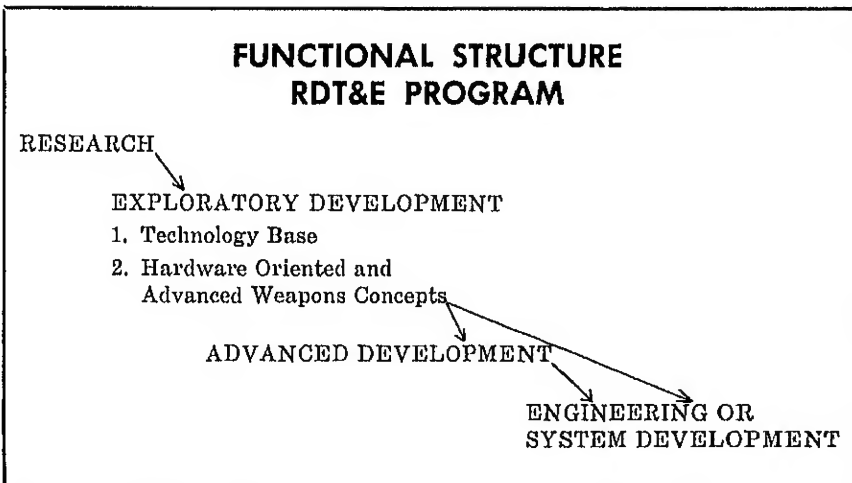


Figure 2.

equipment, the cost of modernization versus cost of replacement, and the proximity, availability and cost of borrowing equipment from other laboratories. The most important consideration, as mentioned previously, is whether or not the equipment fulfills a long range need.

Exploratory Development Policy and Planning

The Munitions Command exploratory development program, in contrast to the research program, is geared toward providing solutions to specific military problems, as related to weapon materials and concepts. That part of the exploratory development effort, which is expected to culminate in improvements in the state of the art of materials, is considered "technological base" activity. It is characterized by work in such projects as rocket and missile propellants, explosives, metals research for Army materiel, medical defense aspects of chemical agents, lubricants, friction and wear, and applied research in radio-frequency effects on warhead sections and weapon systems.

The exploratory development, which is expected to culminate in the feasibility of new munitions concepts, is the "hardware-oriented and advanced weapons concepts" activity. Typical of this activity is work in such areas as artillery ammunition, propellant-actuated devices, non-nuclear warheads for guided missiles, fuze supporting research, and chemical weapons systems technology.

Under the existing Army research and development management system, exploratory development is a part of the concept formulation phase of the research and development cycle, wherein the promise or probability of meeting full-scale development objectives is determined, namely, operational, cost and schedule objectives (see Figure 2). There are certain prerequisites to entering into engineering or operational system development. They include the assurance that the technology needed is available, that the best technical approaches have been selected, and that cost and schedule estimates are credible and acceptable. Clearly, exploratory development efforts should lead to real and definable objectives. Therefore, the management policy and tools for insuring productivity

in this work must be different from those governing research. The fact that scientists work jointly with engineers in such programs provides no license for management to apply research policies and criteria in the conduct of exploratory development.

Several industrial management systems, still used today, have been attempted for exploratory development (applied research). They have the common objective of forecasting milestones and expenditures, and are designed for periodic monitoring of progress in accordance with anticipated schedules. The premise on which such planning is based is that engineers and scientists normally work in accordance with a preconceived plan; if a system is devised with sufficient flexibility to permit change in direction, it can be an invaluable tool to program management of exploratory development activities.

The gamut of criticism, regarding the desirability of such industrial management systems, is as diverse as the professions involved in the business of research and development. Attitudes in the research and development community range from partial acceptance to complete rejection.

Policy on QMDO Planning.

Department of the Army policy requires the assurance that exploratory development activity and pro-

grams support operational objectives and the Qualitative Materiel Development Objective (QMDO). The latter is an approved statement of a Department of the Army military need for developing new materiel. The *modus operandi* for the accomplishment of this is the QMDO plan which has been adopted by all of the Army Materiel Command agencies and laboratories, including the Army Munitions Command. It differs from the majority of industrial management systems in not being a time-phased schedule of milestones. However, it is a useful mechanism to assure that exploratory development effort, towards an approved objective or objectives, is identified and defined, and that costs for materiel, equipment and manpower are properly estimated and budgeted.

The nucleus of such a plan is the QMDO Plan Network Structure (see Figure 3). The network is a chart which outlines and identifies the materiel objectives, and delineates the weapon concepts or materiel concepts thought to be attainable within the estimated time frame for accomplishing the objectives. In addition, the network illustrates, for each concept, the technical approaches to be pursued and concomitant major barrier problems to be solved in order to achieve the objectives. Each such major barrier problem, representing an identified technical information

(Continued on Inside Back Cover)

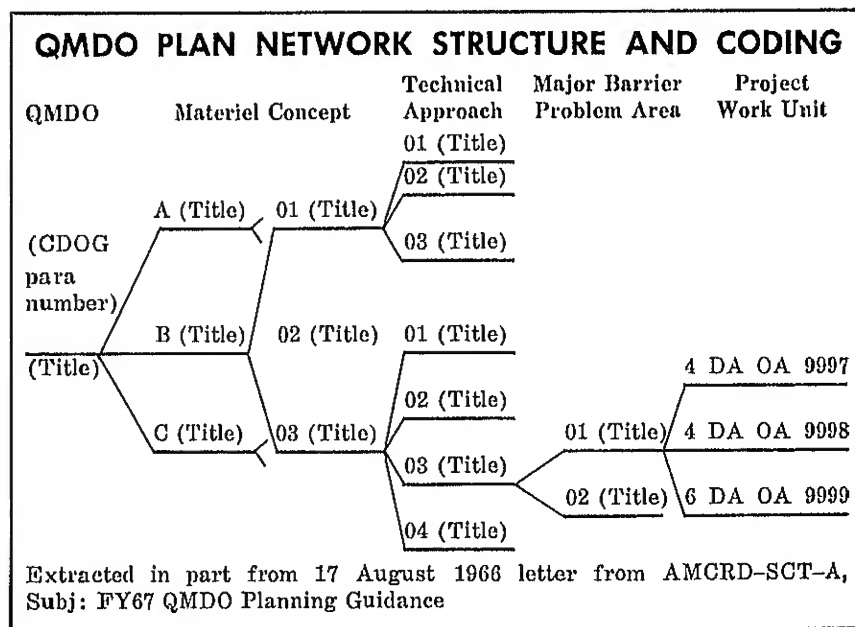


Figure 3.

Cost Information Reports Progress and Plans

Colonel Herbert Waldman, USAF

In April 1966, after more than a year of internal development and many discussions with industry, the Defense Department embarked on a new program, the Cost Information Reports (CIR), designed to improve the collection of contract cost data which are used to develop independent DOD cost estimates for a variety of needs. Over 250 separate companies were contacted for comments on the CIR instructions, and many meetings were held under the auspices of the newly formed Council of Defense and Space Industry Associations (CODSIA) to resolve incipient issues over the proposed procedures.

Concurrently with these steps, new manpower increases were authorized for an expansion of the force of cost analysis specialists who would be assigned to the Military Departments

to work on these problems. The organization of cost analysis groups has been a key feature in achieving a usable capability.

The Cost Information Reports were designed to meet cost data needs of all the Military Departments, by using one set of uniform procedures which would obviate the need for each Department to create what could be duplicate or overlapping requirements for cost information. As a part of these procedures, the Office of the Secretary of Defense required the submission of a CIR Data Plan for approval, before a recurring reporting of data might be installed as a requirement in a contract.

CIR development and evolution are governed by the same basic precepts today as were first described by Assistant Secretary of Defense (Comptroller) Robert N. Anthony, during

the Advanced Planning Briefings for Industry given nation-wide during the Spring of 1966 (*Defense Industry Bulletin*, April 1966, page 19), which are to:

- Standardize and control DOD data demands on contractors and in-house facilities. The intent, pure and simple, is to reduce markedly the volume, variety and number of management-type reports which DOD demands of industry.
- Minimize pressures to change effective contractor management accounting systems, but insure that data are credible and timely.
- Recognize that needs for data differ at various management levels. In particular, limit the flow of data to top DOD management to that needed for the carrying out of top management responsibilities.
- Leave room for innovation and progress and, hence, minimize the mandatory features.
- Recognize the paramount interest of the first-line manager, i.e., the project manager.

Work is continuing within DOD to evolve methods for extending CIR coverage to systems which are not in the aerospace category.

As indicated in Figure 1, proposals are being reviewed for expansion in coverage to include ground electronics and ordnance systems. Eventually consideration will also be given to the need for historical cost data for ships and armor systems. Before any such requirements may be officially approved for general use, approval of the Bureau of the Budget under the Federal Reports Act (5 USC 139) will, of course, be obtained.

In undertaking this approach the objectives of the Office of the Secretary of Defense (OSD) were to obtain better cost data with which the internal management of DOD resources could be improved. Underlying this need was a recognized de-

STATUS OF CIR IMPLEMENTATION				
Department of Defense				
April 30, 1968				
DEPARTMENT	DATA PLANS :			REPORTING IN PROCESS
	RECEIVED	APPROVED	UNDER REVIEW	
ARMY PROGRAMS	12	10	3	7 (13 CONTRACTS)
NAVY PROGRAMS	20	20	-	5 (8 CONTRACTS)
AIR FORCE PROGRAMS	17	8	12	7 (14 CONTRACTS)
TOTALS	49	38	15	19 (35 CONTRACTS)
WEAPON SYSTEM FAMILY				
AIRCRAFT	25	21	4	12
MISSILES	16	14	6	3
SPACE SYSTEMS / LAUNCH VEHICLES	6	3	4	4
OTHER **	2	-	1	-

* THE NUMBER OF REVISED DATA PLANS SUBMITTED BY THE MILITARY DEPARTMENTS IS NOT INCLUDED IN THESE FIGURES

** GROUND ELECTRONICS AND ORDNANCE SYSTEMS PROPOSED FOR COVERAGE

Figure 1.

The highest frequency requirement for any CIR report is quarterly, which is authorized for one form (the Progress Curve Report) among the set of five CIR forms. Typical DOD

To insure that selectivity is practiced in identifying cost data to be collected, OSD has installed a regulatory mechanism to assure that the data requirement, which a project manager proposes to install in the contracts for his project, will be screened by a high level review group advising the Assistant Secretary of Defense (Comptroller) in these matters. Under this procedure, the recurring cost data requirements to be incorporated within a given contract, or series of contracts, for a given weapon or support system are submitted by the appropriate Military Department to the Office of the Assistant Secretary of Defense (Comptroller) for review. This is shown in Block 1 of Figure 2. In the most frequent cases, the procedure has followed Blocks 2, 3, 4, 5 and 6. Where special conditions exist, one or more alternative paths shown in the chart can be followed. Modifications to submitted Data Plans have been required in the past because of uncertainty

In all cases, although not shown in any block except 4A, representatives of the Military Departments meet with the CIR Data Review Committee, which is comprised of representatives of the Assistant Secretaries of Defense (Comptroller), (Installation and Logistics) and (Systems



Analysis), and the Director of Defense Research and Engineering, to review the content and merits of each specific proposal under consideration. During the committee review, the proposed cost data requirements are examined for adherence to OSD requirements and appropriateness, and utility of data in the degree of detail specified. Any additional or unique data requirements have to be fully justified before approval is granted. This procedure is insurance against undesirable proliferation.

The operation of these procedures for two years has seen the fulfillment of commitments which were publicly made to industry at large that DOD management was embarking on a centrally regulated program to obtain information from contractors. On their part, contractors have been most cooperative in seeking to meet DOD needs. In cases where difficulty has appeared to exist, discussions among the technicians, concerned with the problems of reporting and acquiring the data, have successfully provided a satisfactory solution. Such procedures will continue to be used by those of us who are making the effort to keep needed information flowing in an effective channel. Hopefully, this cooperative approach will be continued, so that new techniques in cost analysis and cost research can be realized with the help of the data which are becoming available through the CIR program.



Colonel Herbert Waldman, USAF, is Director of Assets Management Systems in the Office of the Assistant Secretary of Defense (Comptroller). He holds a master's degree in business administration from the University of Michigan as well as a masters degree in international affairs from George Washington University.

Cost Contractor's Liability

(Continued from Page 20)

judicial avenue of relief is cumbersome and expensive.³⁴

The parties should be afforded an opportunity to negotiate in advance the full measure of damages assessable against the contractor in event of breach. The results of this negotiation, contractually recorded, would protect the contractor from unconscionable loss; and it would relieve the Government from the onerous task of seeking judicial resolution of damages. A balancing of interests

³⁴ *Kolker v. United States*, 40 F. Supp. 972 (D.C. Md. 1941). But see *Cannon Constr. Co. v. United States*, 319 F. 2d 173 (Ct. Cl. 1963) which endorses bilateral administrative settlements of unliquidated claims based on breach of contract.

would be achieved.

Because of the difficulty and uncertainty of establishing actual damages, this approach would be justified.³⁵ Further, it would be legally enforceable so long as the agreed amount is not so high as to constitute a penalty.³⁶

In essence, a liquidated damages clause is suggested. More euphemistically, and perhaps more accurately, it could be labeled a "Limitation of Contractor Obligation" clause. As a by-product, the suggested clause would effectively dispel any lingering doubt as to the contractor's liability for breach of contract damages.

³⁵ *United States v. Walkof*, 144 F. 2d 75 (2d Cir. 1944).

³⁶ *Steffen v. United States*, 213 F. 2d 266 (6th Cir. 1954).

ARMED SERVICES PROCUREMENT REGULATION

(1963 Edition Including All Revisions Up To Date)

Establishes for the Department of Defense uniform policies and procedures relating procurement of supplies and services under the authority of Chapter 137, Title 10 of the United States Code, or under other statutory authority. It applies to all purchases and contracts made by the Department of Defense within or outside the U.S., for the procurement of supplies or services which obligate appropriated funds (including available contract authorizations), unless otherwise specified, except transportation services procured by transportation requests, transportation warrants, bills of lading, and similar transportation forms.

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SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	III	Oct	Nov	Dec	IV	1968 Jan	Feb	Mar	I
I. Military Prime Contract Awards															
Aircraft.....	\$1,945	\$2,939	\$2,636	\$2,262	\$2,102	\$3,049	\$2,513	\$1,249	\$ 578	\$ 805	\$ 2,632	\$ 442	\$ 530	\$ 574	1,546
Missile & Space Systems.....	1,040	987	1,314	861	1,230	1,166	1,580	323	429	316	1,068	348	393	393	1,511
Ships.....	355	491	876	239	679	407	417	153	147	110	410	109	79	236	424
Weapons & Ammunition.....	555	1,486	632	940	818	1,763	1,104	454	451	439	1,344	226	416	383	1,025
Electronic & Communications Equip.....	918	1,574	666	915	971	1,848	816	272	247	305	824	359	264	871	900
Other Hard Goods.....	843	1,842	660	1,029	915	1,564	785	252	153	248	653	246	348	306	779
Soft Goods.....	709	922	1,078	989	638	652	1,056	175	118	198	491	437	140	202	779
Construction.....	207	392	198	150	232	656	232	56	44	113	213	61	53	87	181
All Other.....	1,406	1,963	2,356	1,639	1,605	1,987	2,335	522	486	649	1,657	457	470	534	1,461
Total (Excl. Work Outside U.S.).....	7,978	12,646	10,536	9,024	9,190	13,088	10,838	3,456	2,653	3,183	9,292	2,685	2,770	2,943	5,398
Total Seasonally Adjusted.....	8,703	10,144	10,716	10,119	10,171	10,667	10,961	3,665(R)	3,308	3,479	10,413	2,887	3,445	3,124	9,456
Work Outside U.S.....	521	1,195	856	672	453	834	891	193	117	145	455	288	139	134	561
II. Gross Obligations Incurred															
Operations.....	8,326	9,604	10,426	9,702	10,229	11,435	11,234	3,776	3,374	3,663	10,812	3,798	3,435	---	---
Procurement.....	4,374	8,599	4,368	5,276	5,113	8,948	6,154	2,699	1,717	1,876	6,992	1,784	1,865	---	---
Other.....	2,429	3,470	3,433	2,230	2,519	3,510	3,420	860	665	669	2,194	863	792	---	---
Total.....	15,129	21,613	19,247	17,208	17,861	23,893	20,798	7,335	5,755	6,208	19,298	6,445	6,092	---	---
III. Gross Unpaid Obligations Outstanding															
Operations.....	3,828	3,777	4,792	5,094	4,644	4,513	5,267	5,270	5,050	5,150	5,150	5,127	5,127	---	---
Procurement.....	18,023	22,119	22,736	23,173	22,780	25,248	24,925	25,423	24,982	24,856	24,856	24,197	24,024	---	---
Other.....	5,625	5,942	8,026	7,253	6,996	7,506	7,971(R)	7,854	7,609	7,360	7,360	7,329	7,303	---	---
Total.....	27,476	30,838	35,554	35,430	34,420	37,267	38,163(R)	38,547	37,641	37,366	37,366	36,653	36,454	---	---
IV. Net Expenditures															
Operations.....	7,689	9,076	8,908	9,087	10,002	10,731	10,001	3,641	3,456	3,397	10,494	3,550	3,273	---	---
Procurement.....	3,631	3,866	4,392	4,264	5,074	5,282	6,060	2,005	1,890	1,704	5,598	2,274	1,913	---	---
Other.....	2,757	2,647	2,484	3,092	3,160	2,001	3,017	790	847	724	2,363	1,153	1,032	---	---
Total.....	14,097	15,609	15,844	16,443	18,236	18,014	19,108	6,436	6,194	5,825	18,455	6,977	6,218	---	---
V. DOD Personal Compensation															
Military.....	3,181	3,249	3,551	3,606	3,624	3,646	3,842	1,264	1,297	1,411	3,972	1,338	1,339	---	---
Civilian.....	1,937	2,015	2,105	2,135	2,170	2,248	2,271	773	772	787	2,332	828	774	764(P)	2,366(P)
Total.....	5,118	5,264	5,656	5,741	5,794	5,894	6,113	2,037	2,069	2,198	6,304	2,116	2,113	---	---
VI. Outstanding Payments															
Advance Payments.....	66	79	90	83	92	80	110	---	---	---	134	---	---	---	---
Progress Payments.....	4,402	4,346	4,750	5,461	5,981	6,765	7,179	---	---	---	7,491	---	---	---	---
Total.....	4,468	4,425	4,840	5,544	6,073	6,845	7,289	---	---	---	7,625	---	---	---	---
VII. Strength (Manpower)															
Military.....	2,969	3,094	3,229	3,334	3,371	3,377	3,412	3,416	3,412	3,398	3,398	3,427	3,440	---	---
Civilian.....	1,088	1,138	1,184	1,230	1,268	1,303	1,274	1,277	1,277	1,271	1,271	1,267	1,265	1,266(P)	---

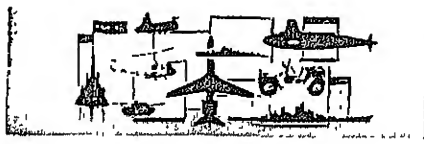
NA = Not Available

P = Preliminary

R = Revised

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
April 29, 1968



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of April 1968:

DEFENSE SUPPLY AGENCY

- 1—J. P. Stevens & Co., New York, N.Y. \$1,618,190. 536,000 yards of tropical wool cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1946.
- 2—Alpha Industries, Knoxville, Tenn. \$1,054,500. 150,000 men's field coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1974.
- J. P. Stevens & Co., New York, N.Y. \$1,748,250. 450,000 linear yards of wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1970.
- South Jersey Clothing Co., Minotola, N.J. \$1,181,073. 54,730 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1803.
- Humble Oil & Refining Co., Houston, Tex. \$1,083,600. 240,000 barrels of automotive gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0803 P002.
- Humble Oil & Refining Co., Houston, Tex. \$3,441,900. 800,000 barrels of diesel fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0805.
- Mobil Oil Corp., New York, N.Y. \$2,027,970. 435,000 barrels of diesel fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0818.
- 3—U.S. Steel International, Washington, D.C. \$2,366,546. 27,449,843 lbs of corrugated steel sheets. Defense Industrial Supply Center, Philadelphia, Pa. DSA 500-68-C-0271.
- Delta Petroleum, New Orleans, La. \$1,559,304. 3,951,631 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 640-68D-0048 P001.
- 5—Burlington Industries, New York, N.Y. \$4,738,438. 3,098,904 white cotton bed sheets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1992.
- Pembroke, Inc., Egg Harbor, N.J. \$1,483,081. 80,080 men's wool serge overcoats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2003.
- 10—Lukens Steel Co., Coatesville, Pa. \$1,530,900. Seven bow sonarapheres. Defense Industrial Supply Center, Philadelphia, Pa. DSA 500-68-C-0270.
- 11—Trenton Textile Engineering & Mfg. Co., Trenton, N.J. \$1,683,000. 300,000 nylon-coated twill ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2052.
- Wilson Co., Centerville, Tenn. \$1,366,315. 243,550 nylon-coated twill ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2053.
- 15—Ojus Industries, Miami, Fla. \$1,869,812. 173,030 rolls of concertina tape. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-6638.
- 16—Gulf States Asphalt Co., Columbus, Ohio. \$1,355,023. 6,609,870 gallons of soil binder. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-D-0070-0007.
- Borden Co., New York, N.Y. \$1,735,360. 177,012 cases of canned milk. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-20439.
- Economy Mfg. Co., Seney, Ark. \$1,650,527. 132,306 plywood trunk lockers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-1150.

- North American Packing Co., Boston, Mass. \$1,595,472. 1,295,000 cans of ham hunks. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-13447.
- 18—Hess Oil & Chemical Corp., Perth Amboy, N.J. \$1,783,189. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1473.
- 19—Texaco, Inc., New York, N.Y. \$3,252,670. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1511.
- 23—Joseph Pickard Sons Co., Philadelphia, Pa. \$3,223,500. 15,000 bundles of landing mats. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-6036.
- 24—Stauffer Chemical Co., New York, N.Y. \$1,868,204. 325,898 gallons of aircraft turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-C-1007.
- Martin Lane Co., Elizabeth, N.J. \$1,120,672. 128,656 body armor vests. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2159.
- 29—Dowling Bag Co., Valdosta, Ga. \$1,837,500. 8,750,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-5601.
- Cavaller Bag Co., Lumberton, N.C. \$2,240,500. 11,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-5600.
- Kaiser Steel, El Monte, Calif. \$1,776,013. 8,373 bundles of landing mats. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-6994.

- Flanagan Shipping Corp., Port Arthur, Tex. \$2,485,810. Stevedoring and related terminal services for a two-year period. Beaumont, Tex. Eastern Area, MTMTS, Brooklyn, N.Y. DA-HC21 68-C-0093.
- Hughes Tool Co., Culver City, Calif. \$2,426,584. Rotary wing blades for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA-23-204-AMC-03697 (T).
- Riddle Contracting Co., Salina, Kan. \$1,664,604. Relocation of 18.4 miles of country roads in connection with the Perry Dam and Reservoir Project, Jefferson County, Kan. Engineer Dist., Kansas City, Mo. DA-CW41-68-C-0120.
- Philco-Ford Corp., Newport Beach, Calif. \$1,444,118. Continued development of the XM149, 30mm automatic gun for installation on UH-1B helicopters. Army Arsenal, Rock Island, Ill. DA-AF65-67-C-0024.
- Page Communications Engineers, Washington, D.C. \$1,360,475. Engineers, furnish and install communication-electronic subsystems equipment in the new EUCOM Command Center, Stuttgart, Germany and Washington, D.C. DA-AB07-68-C-0137.
- Standard Dredging Corp., New Orleans, La. \$1,081,688. Rental of dredging equipment in connection with the Mississippi River Channel Improvements Project, Shelby County and Dyer County, Tenn. Engineer Dist., Memphis, Tenn. DA-CW66-88-L-0089.
- 3—Harrington & Richardson, Inc., Worcester, Mass. \$1,826,016. 7.6mm gun barrels. Army Weapons Command, Rock Island, Ill. DA-AF-63-68-C-0055.
- TRW, Inc., Redondo Beach, Calif. \$1,000,000. Classified R&D. Electronics Command, Fort Monmouth, N.J.
- U.S. Steel, Pittsburgh, Pa. \$2,422,265. Eight-inch projectile metal parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-67-C-0279.
- Collins Radio Co., Cedar Rapids, Iowa. \$1,352,789. AN/GRC-158 radio sets. Electronics Command, Fort Monmouth, N.J. DA-AB-67-68-C-0251.
- Kilgore Corp., Toome, Tenn. \$2,043,910. Parachute illuminating flares. Planting Arsenal, Dover, N.J. DA-AA-21-68-C-0830.
- Troup Bros., Inc., Coral Gables, Fla. \$1,049,866. Construction work on the Central and Southern Florida Project, Indiantown, Fla. Engineer Dist., Jacksonville, Fla. DA-CW-17-68-C-0084.
- Martin-Marietta, Orlando, Fla. \$4,500,000. Ground support equipment for the Pershing missile. Army Missile Command, Huntsville, Ala. DA-A11-61-08-C-1628.
- 4—KDI Corp., Cincinnati, Ohio. \$1,381,200. Metal parts for fuzes for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA00-68-C-0133.
- 5—Maremont Corp., Saco, Maine. \$3,774,154. 7.62mm machine guns with spare barrel and blood assemblies. Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0087.
- Hercules Engines, Canton, Ohio. \$1,071,506. Ten- and twenty-horsepower gasoline engines. Mobility Equipment Command, St. Louis, Mo. DA-23-196-AMC-00284 (T).
- Union Carbide, New York, N.Y. \$3,105,525. Dry batteries for radio sets. Charlotte, N.C. DA-AB05-68-C-2379; \$2,627,285. Dry batteries for radio sets. Charlotte, N.C. DA-AB05-68-C-2380. Electronics Command, Philadelphia, Pa.
- Elsen Bros., Hoboken, N.J. \$1,647,550. Metal parts for 40mm high explosive projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AG2F-68-C-0723.
- Raytheon Co., Lexington, Mass. \$1,303,250. Metal parts for bomb fuzes. Bristol, Tenn. Army Procurement Agency, New York, N.Y. DA-AA08-68-C-0243.
- 8—Face Corp., Memphis, Tenn. \$1,609,054. Surface flares. Camden and Russell, Ark. Planting Arsenal, Dover, N.J. DA-AA21-68-C-0497.
- 9—Midvale-Heppenstall Co., Philadelphia, Pa. \$2,325,600. Forging of alloy steel tubes



DEPARTMENT OF THE ARMY

- 1—Federal Cartridge Corp., Minneapolis, Minn. \$9,844,176. Production of ammunition and maintenance of the Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-86-038-AMC-01099 (A).
- AVCO Corp., Stratford, Conn. \$5,499,000. To establish a second production capability for T-63 helicopter engines. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1707.
- R.C.A., Moorestown, N.J. \$4,892,931. A prototype and five production units of a mobile instrumentation radar system. White Sands Missile Range, N.M. DA-AD07-68-C-0015.
- Sylvania Electric Products, Williamsville, N.Y. \$2,090,000. Reliability testing and de-bugging of helicopter radio sets. Buffalo, N.Y., Long Island City, N.Y., and Dartmouth, Nova Scotia. Electronics Command, Fort Monmouth, N.J. DA-28-043-AMC-01043 (E).
- General Instrument Corp., Chicopee, Mass. \$1,113,750. Metal parts for 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0245.
- 2—Aberthaw Construction Co., Boston, Mass. \$5,022,843. Construction of a three-story guidance laboratory, a two-story optics laboratory, and a shipping and receiving building at the NASA Electronics Research Center, Cambridge, Mass. New England Div., Corp of Engineers. DA-GA-38-68-C-9005.
- Martin-Marietta, Orlando, Fla. \$3,560,339. Industrial engineering services in support of the Pershing 1A weapons system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0257.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract number.

- for 175mm guns Watervliet Arsenal, Watervliet, N.Y. DA-AF07-68-C-0155
- Southwest Truck Body Co., St. Louis, Mo. \$2,497,182 Semi-trailer mounted repair shop equipment. West Plains, Mo. Mobility Equipment Command, St. Louis, Mo. DA-AK 1-68-C-2287
- Great Lakes Dredging & Dock Co., Baltimore, Md. \$7,451,185 Dredging work on the Chesapeake and Delaware River Canal Project. New Castle County, Del. and Cecil County, Md. Engineer Dist., Philadelphia, Pa. DA-CW61-68-C-0193
- Bowen-McLaughlin-York Co., York, Pa. \$1,625,000 Retrofit of M48A1 tanks to M48A3 tank configuration Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0076
- San Ore Gardner, Houston, Tex. \$5,787,200. Construction of concrete gravity type dam and appurtenant works at the West Point Reservoir Project Chambers County, Ala. and Troup County, Ga. Engineer Dist., Savannah, Ga. DA-CW-21-68-C-0050
- 10—Chamberlain Mfg. Corp., Elmhurst, Ill. \$4,828,608, 155mm high explosive projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0365
- Grosshans & Petersen, Inc., Marysville, Kan. \$1,056,817. Construction work on the Webbs Falls Lock & Dam Project. Engineer Dist., Tulsa, Okla.
- Guy F. Atkinson Co., San Francisco, Calif. \$1,133,948. Repair of lock walls at the Lower Monumental Lock and Dam Project, Snake River, Wash. Engineer Dist., Seattle, Wash. DA-CW-67-68-C-0059
- Amron Corp., Waukesha, Wis. \$1,591,618. Metal parts for 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0233
- Carter Carburator, Olivette, Mo. \$1,779,456. Metal parts for fuzes for 81mm explosive cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0201
- 11—Kanarr Corp., Kingston, Pa. \$2,115,021. 40mm grenade launchers (M79). Army Weapons Command, Rock Island, Ill. DA-11-199-AMC-00715 (W)
- Potashnick Construction, Inc., Fort Lauderdale, Fla. \$1,099,490. Excavation work at the Four Rivers Basin Flood Control Project Hillsborough County, Fla. Engineer Dist., Jacksonville, Fla. DA-CW17-68-C-0068
- Northrop-Carlson, Inc., Asheville, N.C. \$1,280,836 Parachute ground flares Aberdeen Proving Ground, Md. DA-AD05-68-C-0369
- 12—American Machine & Foundry Co., Brooklyn, N.Y. \$8,811,119 Metal parts for 750-lb. bombs. Garden City, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-68-C-161
- Emerson Electric, St. Louis, Mo. \$4,715,863. Line item repair parts for the XM-28 armament sub-system. Army Weapons Command, Rock Island, Ill.
- Bell Helicopter, Fort Worth, Tex. \$5,500,000. AH-1G Cobra helicopters. Hurst, Tex. DA-AJ01-67-C-0469, \$19,497,888. UH-1H Huey helicopters. Hurst, Tex. DA-AJ01-68-C-0566. Aviation Materiel Command, St. Louis, Mo.
- Boeing Co., Morton, Pa. \$9,000,000. CH-47C Chinook helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1784
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$2,810,600. Supplies and services for production of OV-10 Mohawk aircraft and related items. Stuart, Fla. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-0190
- 16—Baldwin-Lima-Hamilton Corp., Philadelphia. \$8,406,541. Design, manufacture, delivery and test of six hydraulic pump turbines for the Kaysinger Bluff Reservoir Project. Edinburg, Pa. Engineer Dist., Kansas City, Mo. DA-CW-41-68-C-0131
- Chamberlain Mfg. Corp., Waterloo, Iowa. \$1,316,700. Metal parts for warheads for 275-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0090
- Bogue Electric Mfg. Co., Paterson, N.J. \$1,169,642. 1,081 three-kilowatt generator sets. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-7001
- 18—Harnischfeger Corp., Milwaukee, Wis. \$1,259,276. 20-ton truck-mounted cranes Escanaba, Mich. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-B990
- Raytheon Corp., Andover, Mass. \$1,800,000. Production of Hawk industrial prototype hardware. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0703
- 17—Granit Construction Co., Watsonville, Calif. \$1,344,600. Work on the flood protection project at Klamath, Calif. Engineer Dist., San Francisco, Calif. DA-CW07-68-C-0046
- Hercules Engines, Inc. \$2,551,750. Multi-fuel engine assemblies for five-ton trucks Tank Automotive Command, Warren, Mich. DA-AE-97-68-C-2234
- Hansel Phelps Construction Co., Greeley, Colo. \$1,921,705. Work on the Trinidad Dam and Reservoir Project in Las Animas County, Colo. Engineer Dist., Albuquerque, N.M. DA-CW01-68-C-0088
- Pace Corp., Memphis, Tenn. \$1,197,461. M123A1 and M112A1 cartridges. Camden, Ark. Pictantiny Arsenal, Dover, N.J. DA-AA21-68-C-0363
- Dravo Corp., Pittsburgh, Pa. \$16,182,400. Construction of a lock and dam at the Jones Bluff and Dam Project. Autauga and Lowndes County, Ala. Engineer Dist., Mobile, Ala. DA-CW01-68-C-0088
- Cosmodyne Corp., Torrance, Calif. \$1,898,323. Alterations to the Climatic Test Facility at Eglin AFB, Fla. Engineer Dist., Mobile, Ala. DA-CA01-68-C-0036
- Massman Construction Co., Kansas City, Mo. \$3,745,597. Work on lock and dam number four, Arkansas River Project Jefferson County, Ark. Engineer Dist., Little Rock, Ark. DA-CW03-68-C-0073
- Boeing Co., Morton, Pa. \$6,161,700. Line items of spare parts for support of CH47 (Chinook) helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0005
- 18—Standard Products Co., Cleveland, Ohio. \$1,083,208. T135 track-shoe assemblies for M114 vehicles. Port Clinton, Ohio. Tank Automotive Command, Warren, Mich. DA-AE-07-68-C-1405
- General Motors, Detroit, Mich. \$1,005,540. 6V53 diesel engines for M113 vehicles Tank Automotive Command, Warren, Mich. DA-AE-07-68-C-0410
- Pace Corp., Memphis, Tenn. \$5,799,304. Illuminating signals. Pictantiny Arsenal, Dover, N.J. DA-AA-21-68-C-0054
- Bauer Dredging Co., Port Lavaca, Tex. \$1,003,270. Rental of a cutterhead dredge for use on the Mississippi River tributaries channel improvement project Engineer Dist., Vicksburg, Miss. DA-CW-38-68-C-0113
- Gibbons & Reed Co., Portland, Ore. \$1,641,183. Work on the Lower Monumental Lock and Dam Project on the Snake River. Kahlottus, Wash. Engineer Dist., Seattle, Wash. DA-CW-67-68-C-0060
- 19—Bulova Watch Co., Providence, R.I. \$1,609,789. Head assemblies for 60mm mortar fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-68-C-0077
- Remington Arms Co. \$7,673,805. Production of small arms ammunition and maintenance of the Lake City Army Ammunition Plant, Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-49-010-AMC-00003 (A)
- Harvey Aluminum Sales, Torrance, Calif. \$1,631,054. Loading, assembling of ammunition and components and for maintenance and support services at the Milan, Tenn., Ammunition Plant. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00520 (A)
- Thiokol Chemical Corp., Bristol, Pa. \$13,711,831. Operation of the Longhorn Ammunition Plant, Marshall, Tex., and for loading assembling and packing of mortars, rocket motors, igniters and miscellaneous items. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00200 (A)
- I.D. Precision Components Corp., Jamaica, N.Y. \$2,250,000. Metal parts for M557 fuzes. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0235
- UMC Industries, Phoenix, Ariz. \$1,430,100. Loading and assembling 81mm illuminating projectiles. Goodyear, Ariz. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0050
- Olin Mathieson Chemical Corp., East Alton, Ill. \$4,227,482. 81mm illuminating projectiles. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0051
- Amron Corp., Orlando, Fla. \$1,267,255. Metal parts for fuzes for 40mm high explosives. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0117
- Pace Corp., Memphis, Tenn. \$1,355,078. Surface flares. Camden, Ark. Pictantiny Arsenal, Dover, N.J. DA-AA-21-68-C-0497
- Harrington & Richardson Co., Worcester, Mass. \$15,000,000. 5.56mm, M16A1 rifles, inspection, test equipment and facilities. Army Weapons Command, Rock Island, Ill. DA-AF-03-C-0015
- General Motors, Ypsilanti, Mich. \$19,000,000. 5.56mm, M16A1 rifles, inspection, test equipment and facilities. Army Weapons Command, Rock Island, Ill. DA-AF03-68-C-0048
- 22—ITT Gilman, Inc., Los Angeles, Calif. \$1,491,676. Advanced production engineering program for AN/TPQ-28 ground radar sets. Electronics Command, Fort Monmouth, N.J. DA-A107-68-C-0182
- Philco-Ford Corp., Newport Beach, Calif. \$2,406,274. Power supply units for Chaparral missiles. Procurement Agency, Pasadena, Calif. DA-AG07-67-A-0007
- Hol-Gar Mfg. Corp., Primos, Pa. \$6,302,286. 30-KW, diesel engine driven, generator sets. Mobility Equipment Command, St. Louis, Mo. DA-AK01-67-C-1425
- AVCO Corp., Stratford, Conn. \$1,024,380. Turbine nozzles for T-68 engines for UH-1 helicopters. Aviation Materiel Command, St. Louis, Mo. P-41608-67-A-3234
- DeMaure Construction Co., Carson City, Nev. \$1,156,640. Construction of an aircraft maintenance hanger, Maine Corps Air Facility, Futema, Okinawa. Engineer Dist., Okinawa
- 23—Lawless & Alford Co., Austin, Tex. \$1,683,072. Construction of two tactical equipment shops and facilities at Fort Hood, Tex. Engineer Dist., Fort Worth, Tex. DA-CA-68-68-C-0090
- Honeywell, Inc., Hopkins, Minn. \$1,643,220. Metal parts for fuzes for 40mm cartridges. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0005
- National Presto Industries, Eau Claire, Wis. \$7,076,000. Metal parts for 105mm high explosive projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0066
- Goodyear Tire & Rubber Co., Akron, Ohio. \$1,241,980. Rubber tracked shoe assemblies for M48 tanks. St. Marys, Ohio Tank Automotive Command, Warren, Mich. DA-AE-07-68-C-1216
- Ward Industries, Conway, Ark. \$1,438,645. Ambulance conversion/passenger buses. Austin, Tex. Tank Automotive Command, Warren, Mich.
- General Motors, Cleveland, Ohio. \$20,101,815. Motor buses. St. Louis, Mo. and Kosciusko, Miss. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1989
- Chrysler Motors, Detroit, Mich. \$1,315,567. Motor buses. Warren, Mich. and Lima, Ohio. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1900
- International Harvester Co., Chicago, Ill. \$1,753,360. Motor buses and ambulance conversion/passenger buses. Springfield, Ohio; Fort Wayne, Ohio; Conway, Ark.; Richmond, Ind.; Lima, Ohio and Kosciusko, Miss. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1001
- 24—Continental Motors, Muskegon, Mich. \$5,121,466. Engine assemblies for M48 tanks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0407
- Standard Products, Cleveland, Ohio. \$4,906,632. Track shoe assemblies for personnel carriers. Port Clinton, Ohio. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-2259
- Brown & Root, Inc., Houston, Tex. \$2,490,827. Construction on the Sabine-Neches Waterway Project. Port Arthur, Tex. Engineer Dist., Galveston, Tex. DA-CW-64-68-C-0107
- General Motors, Cleveland, Ohio. \$20,101,815. 155mm self-propelled howitzers. Army Weapons Command, Rock Island, Ill. DA-11-199-AMC-610 (W)
- Ford Motors, Dearborn, Mich. \$1,360,200. 884 four-door sedans. Tank Automotive Command, Warren, Mich. DA-AE-07-68-C-2173
- Levinson Steel Co., Pittsburgh, Pa. \$7,400,018. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA-09-68-C-0093
- Ordnance Products, Northeast, Md. \$1,495,538. Fuze assemblies for hand grenades.

- nades, Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-902 (A)
- 25—Honeywell, Inc., Hopkins, Minn. \$2,043,361. Metal parts for fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0114
- 26—Parsons Mfg. & Stamping Co., Cordova, Tenn. \$1,166,943. Rotating disks for 4.2-inch cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0015
- Bulova Watch Co., Valley Stream, N.Y. \$4,098,360. 81mm projectile fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0283
- Hayes-Albion Corp., Albion, Mich. \$2,040,430. 81mm projectiles. Hillside, Mich. and Richmond, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0036
- Chamberlain Mfg. Corp., New Bedford, Mass. \$2,631,250. 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0286
- Kennedy Van Saun Corp., Danville, Pa. \$1,291,500. Metal parts for 4.2-inch mortar projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0180
- American Machine & Foundry Co., York, Pa. \$1,296,000. Metal parts for 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0030
- Klaco Co., St. Louis, Mo. \$2,032,000. Metal parts for 105mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0108
- Eby Construction Co., Wichita, Kan. \$2,813,878. Construction and appurtenant work on the Gilliam Dam and Reservoir Project, Howard and Polk Counties, Ark. Engineer Dist., Tulsa, Okla. DA-CW-56-68-C-0183
- TRW, Cleveland, Ohio. \$2,987,000. Bolt and roller assemblies for M14 rifles. Army Arsenal, Rock Island, Ill. DA-AF01-68-C-0608
- Standard Container Co., Montclair, N.J. \$2,011,500. Ammunition box assemblies. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0058
- Federal Laboratories, Saltsburg, Pa. \$1,012,500. Hand grenades. Edgewood Arsenal, Edgewood, Md. DA-AA15-68-C-0540
- LTV Electronics, Huntington, Ind. \$1,701,210. Radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0005
- Electro Mechanical Corp., Sayre, Pa. \$1,057,540. Electrical equipment shelters. Electronics Command, Philadelphia, Pa. DA-AB05-67-C-2509
- General Electric, Burlington, Vt. \$1,103,700. Automatic aircraft guns and muniments parts. Army Procurement Agency, New York, N.Y. DA-AF03-68-C-0010
- Continental Motors, Muskegon, Mich. \$8,724,800. Multi-fuel engine assemblies for FY 1968 five-ton truck program. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-2815
- Mid-South Pavers, Inc., Nashville, Tenn. \$1,282,098. Construction of a runway with access road, including airfield lighting system and operations building at Arnold Engineering Development Center, Manchester, Tenn. Engineer Dist., Mobile, Ala.
- Continental Motors, Mobile, Ala. \$2,780,000. Work on Government furnished engine assemblies for M48, M60 and M130 combat vehicles. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1166
- Raytheon Co., Andover, Mass. \$2,820,774. Maintenance and modification of special tooling and test equipment for the Hawk missile system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0702
- Baltimore Contractors, Inc., Baltimore, Md. \$5,247,940. Construction of an addition to the Pathology Building at Walter Reed Army Medical Center, Washington, D.C. Engineer Dist., Baltimore, Md. DA-CA-81-68-C-0070
- 20—Uniroyal, Inc., New York, N.Y. \$4,850,147. Operation of the Army Ammunition Plant, Joliet, Ill., and for loading assembling and packing of ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00002 (A).
- Sperry Rand, New York, N.Y. \$11,646,888. Metal parts for medium caliber artillery projectiles, and for loading, assembling and packing of medium caliber ammunition. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00080 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$13,721,396. Operation and maintenance of the Army Ammunition Plant, Charleston, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00097 (A).
- A. O. Smith Corp., Chicago, Ill. \$5,049,450. Metal parts for 750-lb. bombs. Bellmeade, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0078
- R. G. LeTourneau, Inc., Longview, Tex. \$4,141,080. Metal parts for 750-lb bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0030
- General Time Corp., Stamford, Conn. \$4,416,000. Time fuzes. Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0223
- E. I. du Pont Co., Wilmington, Del. \$12,000,000. Design and procurement of equipment and supplies, and installation of five line plants for production of TNT. Newport, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0414
- Donovan Construction Co., New Brighton, Minn. \$4,380,000. Metal parts for 155mm high explosive projectiles. Minneapolis, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0044
- Penner Construction Co., Denver, Colo. \$3,855,729. Construction of six tactical equipment shops and facilities at Fort Riley, Kan. Engineer Dist., Kansas City, Mo. DA-CA41-68-C-0033
- Sperry Rand, Phoenix, Ariz. \$1,544,138. Gyro magnetic compass sets and directional gyros. Army Procurement Agency, Pasadena, Calif. DA-AG07-68-C-1187
- General Motors, Detroit, Mich. \$1,453,159. Diesel engines for M551 vehicles. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0542
- Jahncke Service, Inc., New Orleans, La. \$1,383,840. Rental of a dredge. Engineer Dist., Memphis, Tenn. DA-CV66-68-L-0098
- Jelco, Inc., Salt Lake City, Utah. \$2,599,783. Power house installation on the Little Goose Lock and Dam Project. Whitman County, Wash. Engineer Dist., Walla Walla, Wash. DA-CW68-C-0080
- Stewart-Erickson, Seattle, Wash. \$1,207,389. Grading and excavation work on the Little Goose Lock and Dam Project. Whitman County, Wash. Engineer Dist., Walla Walla, Wash. DA-CW68-C-0086
- Sante Fe Engineers, Inc., and Matich Bros., Lancaster, Calif. \$2,041,645. Construction of an aircraft test complex at Edwards AFB, Calif. DA-CA00-68-C-0104
- 30—Batesville Mfg. Co., Batesville, Ark. \$2,395,800. Bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0053
- Action Mfg. Co., Philadelphia, Pa. \$1,500,000. Metal parts for bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0085
- Standard Container Co., Montclair, N.J. \$1,522,593. Packing boxes for ammunition. Homerville, Ga. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0596
- Allis Chalmers Mfg. Co., Milwaukee, Wis. \$2,200,863. Scoop loaders. Deerfield, Ill. Mobility Equipment Command, St. Louis, Mo. DA-AK01-67-C-1411
- General Dynamics, Pomona, Calif. \$1,051,598. Engineering services for the Redeye missile system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0374
- Sanders Associates, Bedford, Mass. \$1,562,593. Advanced production engineering for the Forward Area Alert Radar. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1930
- Hercules, Inc., Wilmington, Del. \$8,563,845. Operation of the Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. W-11-173-AMC-0037 (A).
- Philo-Ford Corp., Philadelphia, Pa. \$5,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.

- Boeing Co., Morton, Pa. \$7,674,240. Spare parts for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ-01-68-A-0005
- Hughes Aircraft, Fullerton, Calif. \$2,258,109. Radio sets and components. Army Procurement Agency, Pasadena, Calif. DA-AB05-68-C-0008
- Hughes Aircraft, Fullerton, Calif. \$3,110,922. Semi-automatic flight operations center, ancillary items and reports. Electronics Command, Fort Monmouth, N.J. DA-AH07-68-C-0354
- Hughes Tool Co., Culver City, Calif. \$7,472,000. Light observation helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1785
- Collins Radio Co., Dallas, Tex. \$1,179,333. Ten radio terminal sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0020
- Holton Tractor Co., Portland, Ore. \$1,061,380. Maintenance and overhaul of 93 tractors. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-7184
- Raytheon Co., Andover, Mass. \$9,197,772. Hawk industrial prototype hardware. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0703
- Olin Mathieson Chemical Corp., East Alton, Ill. \$3,684,480. Propellant for 7.62mm ball ammunition and 20mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0617
- Aerofet General, Azusa, Calif. \$2,272,750. Seven forward looking infrared target acquisition fire control systems. Frankford Arsenal, Philadelphia, Pa. DA-AA25-67-C-0471
- Security Signals, Inc., Cordova, Tenn. \$1,402,878. Igniter time blasting fuzes. Army Procurement Agency, Cincinnati, Ohio.
- Kaiser Jeep Corp., Toledo, Ohio. \$1,112,084. 1½-ton trucks. General Purpose Vehicle Agency, Warren, Mich. DA-20-113-AMC-10235 (T) MYP.
- Firestone Tire & Rubber Co., Akron, Ohio. \$1,000,000. Reactivation of a plant for production of large caliber ammunition items. Ravena, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-65 (A).



DEPARTMENT OF THE NAVY

- 1—General Electric, West Lynn, Mass. \$9,875,000. Engineering development of the TF-31 turbo-fan engine for V5X aircraft. Naval Air Systems Command, N00019-68-C-0443
- LTV Aerospace Corp., Dallas, Tex. \$3,060,000. Prototype test program for A-7E aircraft. Naval Air Systems Command, N00019-68-C-0075
- 2—United Aircraft, Stratford, Conn. \$3,324,223. UH-34D aircraft. Naval Air Systems Command, N00019-68-C-0336
- Honeywell, Inc., Seattle, Wash. \$1,285,026. MK 48 MOD 0 torpedo program management, test planning, data taking, data reduction, data analysis, full time vessel service and supporting services. Naval Ordnance Systems Command, N00017-68-C-1213 A8-0552-620.
- 3—Louis Allis Co., Greendale, Wis. \$3,147,053. Power supply units for sonar equipment. Naval Ship Systems Command, N00024-68-C-5329
- Industrial Engineering Co., Baltimore, Md. \$1,587,890. Addition to the laboratory and technical support building at the National Naval Medical Center, Bethesda, Md. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C.
- Western Electric, New York, N.Y. \$8,190,000. Oceanographic research. Burlington, N.C. Naval Electronic Systems Command, N00039-68-C-3501
- 4—American Mfg. Co. of Tex., Fort Worth, Tex. \$23,757,671. MK 82, MOD 2 500-lb bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0745.

- PRD Electronics, Westbury, N.Y. \$8,746,308. VAST building blocks and data transfer unit. Naval Air Systems Command N00019-68-C-0449.
- Sanders Associates, Nashua, N.H. \$5,377,500. Work on classified electronic equipment. Naval Air Systems Command, N00019-68-C-0470.
- LTV Aerospace Corp., Dallas, Tex. \$3,109,199. Increase in the limitation of authorization for FY 1968 A-7E aircraft. Naval Air Systems Command N00019-67-C-0082.
- Radiation, Inc., Melbourne, Fla. \$2,086,295. Digital data communication sets. Naval Air Systems Command NOW-66-0326.
- 5—Dynell Electronics, Plainview, N.Y. \$1,244,274. Production of alteration sets for range and beacon trackers for Fire Control System Radar. Naval Ordnance Systems Command N00017-68-2313.
- U.S. Steel, Pittsburgh, Pa. \$1,006,880. MK 82, MOD 2 Bomb bodies McKeesport, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3509.
- 9—Honeywell, Inc., Minneapolis, Minn. \$6,895,300. Rockeye II components. Naval Air Systems Command, N000019-68-C-0316.
- Republic Electronic Industries, Huntington, N.Y. \$4,683,760. Tactical air navigation sets. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-3338.
- United Aircraft, East Hartford, Conn. \$1,801,856. Spare parts for J-52 engines for A4E and A-6A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-8-6900-AS218.
- Consolidated Diesel Electric Co., Old Greenwich, Conn. \$1,216,220. Aircraft spotting dollies. Naval Air Systems Command, N00019-68-C-0394.
- Harvey Aluminum Co., Torrance, Calif. \$1,207,200. Weteye bombs. Naval Air Systems Command, N00019-68-C-0325.
- General Time Corp., Skokie, Ill. \$1,177,056. Mechanical time fuses. Naval Air Systems Command, N00019-68-C-0314.
- 10—Grumman Aircraft, Bethpage, N.Y. \$9,586,632. A-6A aircraft. Naval Air Systems Command, N00019-67-C-0186.
- Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$5,000,000. Overhaul, alteration and C-3 Poseidon missile conversion of the fleet ballistic missile nuclear powered submarine USS Daniel Boone (SSBN-620). Naval Ship Systems Command, N00024-68-C-0260.
- Lockheed Aircraft, Burbank, Calif. \$4,620,000. Configuration changes to P-3B aircraft. Naval Air Systems Command, N00019-68-C-0043.
- Royal Industries, Santa Ana, Calif. \$1,592,649. External auxiliary 600-gallon fuel tanks. Alhambra, Calif. Naval Air Systems Command, N00019-67-C-0640.
- Kollsman Instrument Corp., Elmhurst, N.Y. \$1,205,400. Altitude encoders. Naval Air Systems Command, N00019-68-C-0409.
- 11—LTV Aerospace Corp., Dallas, Tex. \$54,250,023. FY 1968 procurement of A-7D aircraft. Naval Air Systems Command, N00019-67-C-0143.
- Lockheed Aircraft, Burbank, Calif. \$53,679,000. P-3C aircraft. Naval Air Systems Command, N00019-68-C-0073.
- Norris Industries, Los Angeles, Calif. \$22,335,834. MK 82 MOD 1 500-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-C-2085.
- General Signal Corp., Woodbury, N.Y. \$1,360,000. Scan/radar data converters. Naval Air Systems Command, N00019-68-C-0288.
- Trader Construction Co., Havelock, N.C. \$1,264,600. Construction of barracks at Camp Lejeune, N.C. Atlantic Div., Naval Facilities Engineering Command, NBY-88020.
- 12—Aerofet General, Azusa, Calif. \$4,172,893. Development of four swimmer delivery vehicles, two two-man vehicles and two six-man vehicles, with data and support. Naval Training Device Center, Orlando, Fla. N61330-68-C-0104.
- Cardwell Mfg. Co., Wichita, Kan. \$1,205,888. MK 7 MOD 3 arresting engine assemblies and spares. Naval Air Engineering Center, Philadelphia, Pa. N00156-68-C-1818.
- 15—Sanders Associates, Nashua, N.H. \$10,000,000. Electronic equipment. Naval Air Systems Command, NOW (A) 66-0356.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$3,800,000. Long lead time effort and material to support planned FY 1969 procurement of A-6A aircraft. Naval Air Systems Command NOW-66-0058.
- General Dynamics, Pomona, Calif. \$2,634,000. Increased funding for Standard Arm missiles. Naval Air Systems Command N00019-67-C-0399.
- Sperry Rand, Bristol, Tenn. \$1,487,666. Shrike missile guidance and control sections and sets of wings and fins. Naval Air Systems Command, N00019-68-C-0070.
- E. E. Black, Ltd., Honolulu, Hawaii. \$1,169,600. Installation of enlisted men's barracks at the Submarine Base, Pearl Harbor, Hawaii, Pacific Div., Naval Facilities Engineering Command, Honolulu, Hawaii NBY-91001.
- Interstate Electronics, Anaheim, Calif. \$1,000,000. Poseidon missile test instrumentation portable data processing sets. Special Projects Office, N00030-68-C-0230.
- Sperry Gyroscope, Great Neck, N.Y. \$1,087,000. Increase in the limitation of authorization for Terrier MK 76 MOD 3 and MOD 5 fire control system modernization. Naval Ordnance Systems Command, N00017-67-C-0045.
- 16—Magnavox Co., Fort Wayne, Ind. \$10,446,747 (total value of two contracts). Airborne anti-submarine warfare systems. Naval Air Systems Command, N00019-68-C-0497 and N00019-68-C-0498.
- Zachry Co., San Antonio, Tex. \$4,913,000. Construction of an outlying field at the Naval Auxiliary Air Station, Beeville, Tex. Gulf Div., Naval Facilities Engineering Command, New Orleans, La.
- Alco, Inc., St. Louis, Mo. \$4,122,227. Rocket launchers. Naval Air Systems Command, N00019-67-C-0621.
- General Dynamics, Groton, Conn. \$3,000,000. Overhaul, refueling and conversion of the nuclear powered ballistic missile submarine USS Von Steuben (SSBN-632). Naval Ship Systems Command, N00024-68-C-0320.
- Dynalectron Corp., Washington, D.C. \$2,412,343. Data reduction service of photocopied data for the Fleet Missile Systems Analysis and Evaluation Group. Norfolk, Calif. Navy Purchasing Office, Los Angeles, Calif. N000123-68-C-1303.
- Martin-Marietta, Baltimore, Md. \$1,567,154. Design, development and fabrication of pod launchers, warheads, alignment equipment, gages and measuring equipment for the HART/ZAP weapon. Naval Ordnance Laboratory, White Oaks, Md. N00031-68-C-0277.
- Cosmodyne Corp., Torrance, Calif. \$1,371,201. Three oxygen-nitrogen plants and related data. Naval Ship Systems Command, N00024-68-C-5306.
- Raytheon, Waltham, Mass. \$1,120,800. Traveling wave electron tubes. Navy Electronics Supply Office, Great Lakes, Ill. N00126-68-C-6131.
- Lifton Systems, Silver Spring, Md. \$1,190,509. Electronic countermeasure equipment. College Park, Md. Naval Air Systems Command NOW-66-0003.
- Microwave Associates, Sunnyvale, Calif. \$1,068,000. Traveling wave electron tubes. Navy Electronics Supply Office, Great Lakes, Ill. N00126-68-C-6124.
- Microwave Electronics, Palo Alto, Calif. \$1,031,700. Traveling wave electron tubes. Navy Electronics Supply Office, Great Lakes, Ill. N00126-68-C-6132.
- 17—Akwa-Downey Construction Co., Milwaukee, Wis. \$2,222,000. Construction of a training building at the Naval Training Center, Orlando, Fla. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. NBY-840087.
- 18—Bell Aerosystems Co., Buffalo, N.Y. \$2,400,000. Modification kits for the All Weather Carrier Landing System. Naval Ship Systems Command, N00024-68-C-1229.
- Sperry Rand Corp., St. Paul, Minn. \$2,193,443. Manufacture of AN/TYQ-20 Marine Tactical Data Systems. Naval Electronic Systems Command, N00038-C-3663.
- Clevite Corp., Cleveland, Ohio. \$1,465,725. Research and development of the comb filter techniques of MK 48 torpedoes. Naval Ordnance Systems Command, N00017-67-C-1203, Mod. P006-A3-0541-482.
- 19—General Dynamics, Pomona, Calif. \$7,720,000. Production of medium range Standard Missiles. Naval Ordnance Systems Command, N00017-67-C-0047 MOD P010.
- 22—Honeywell, Inc., St. Petersburg, Fla. \$3,344,595. Poseidon missiles. Special Projects Office, N00030-68-C-0247.
- Lott, Inc., Houston, Tex. \$2,349,000. Construction of an aircraft maintenance hanger at the Naval Auxiliary Air Station, Kingsville, Tex. Gulf Div., Naval Facilities Engineering Command, New Orleans, La. NBY-90395.
- United Aircraft, East Hartford, Conn. \$1,969,217. Increased funding for J52-P-8A engines. Naval Air Systems Command, N00019-67-C-0182.
- Interstate Electronics, Anaheim, Calif. \$1,750,000. Digital test instrumentation sets for Poseidon missiles. Special Projects Office, N00030-68-C-0253.
- Ott-Awtwater, Inc., Seattle, Wash. \$1,588,000. Construction of a station hospital and dental clinic at Naval Air Station, Whidbey Island, Wash. Northwest Div., Naval Facilities Engineering Command, Seattle, Wash. NBY-77270.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$1,480,397. Technical support for the Polaris missile. Special Projects Office, N00030-68-C-0220.
- 23—General Dynamics, Pomona, Calif. \$4,100,000. Additional research and development on the Standard Arm missile. Naval Air Systems Command, N00019-68-C-0400.
- General Electric, Binghamton, N.Y. \$1,392,392. Autopilots. Naval Air Systems Command, N00019-68-C-0306.
- 24—General Electric, Schenectady, N.Y. \$3,970,000. Design and furnishing of nuclear propulsion components. Naval Ship Systems Command N00024-67-C-5014.
- Sylvania Electric Products, Mountain View, Calif. \$8,819,043. Electronic countermeasure systems for EA-3B aircraft. Naval Air Systems Command, N00019-68-C-0499.
- Woods Hole Oceanographic Institution, Woods Hole, Mass. \$2,394,000. Oceanographic studies. Office of Naval Research.
- United Aircraft, Stratford, Conn. \$2,173,000. Airframe parts for C11-63A helicopters. Aviation Supply Office, Philadelphia, Pa. N00383-8-91015A-AB411.
- 25—United Aircraft, East Hartford, Conn. \$3,748,489. Ground support equipment for the TF30 engine. Aviation Supply Office, Philadelphia, Pa. N00383-8-69000A-AF251.
- Pathman Construction Co., Highland Park, Ill. \$2,875,000. Construction of a warehouse, technical training building, barracks and modification of existing buildings at the Naval Air Facility, Detroit, Mich. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill. NBY-74938, NBY-79014.
- Burnett Construction Co., Corpus Christi, Tex. \$2,233,200. Construction of an aircraft maintenance hanger at the Naval Auxiliary Air Station, Beeville, Tex. Gulf Div., Naval Facilities Engineering Command, New Orleans, La. NBY-90396.
- Greenhut Construction Co., Pensacola, Fla. \$1,664,980. Construction of an aircraft weapons system training facility at Keeler AFB, Miss. Gulf Div., Naval Facilities Engineering Command, New Orleans, La. NBY-86303.
- Ries Construction Co., San Diego, Calif. \$1,462,444. Construction of bachelor officers' quarters at the Naval Amphibious Base, Coronado, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. NBY-85207.
- United Aircraft, East Hartford, Conn. \$1,475,420. Test, analysis and evaluation of modified TF30-P-3 engines. Naval Air Systems Command, N00019-68-C-0480.
- 26—United Aircraft, Stratford, Conn. \$37,800,000. C11-63A helicopters. Naval Air Systems Command, N00019-68-C-0471.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$19,000,000. Increase in the limitation of authorization for EA-6A aircraft. Naval Air Systems Command, N00019-68-C-0209.
- Sippican, Inc., Marion, Mass. \$2,375,747. Expandable bathythermograph probes, stripchart recorders and launchers. Naval Ship Systems Command, N00024-68-C-1106.
- Lifton Industries, Woodland Hills, Calif. \$1,713,112. ASQ-61 computer equipment. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-1201-0039.
- Sperry Rand Corp., St. Paul, Minn. \$1,109,872. Design, development and production of computer programs for anti-sub-

marine warfare data processing system. Naval Air Development Center, Johnsville, Pa. N62269-68-C-0669

- 29—Grafton Boat Co., Grafton, Ill. \$1,697,795. Construction of 55 landing crafts. Naval Ship Systems Command. N00021-68-C-0323
- United Aircraft, Hartford, Conn. \$1,500,236. Support assemblies for TF-30-P3 engines for the F-111A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-8-6900A-AF284
- 30—Stanford University, Palo Alto, Calif. \$6,570,000. Research Office of Naval Research
- Bethlehem Steel, Baltimore, Md. \$6,228,000. Modernization of four ocean mine-sweepers. Naval Ship Systems Command. N62078-67-C-0004.
- Norris Industries, Vernon, Calif. \$1,094,456. Motor tubes for air-to-air missiles. Naval Ordnance Laboratory, Indian Head, Md. N00171-68-C-0521
- Tracor, Inc., Austin, Tex. \$1,042,361. Chaff dispensers. Naval Air Systems Command. N00019-68-C-0279.



DEPARTMENT OF THE AIR FORCE

- 1—General Electric, Utica, N.Y. \$2,000,000. Production of airborne countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-1026.
- 2—Bendix Corp., Teterboro, N.J. \$3,640,250. Production of aircraft instruments. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0844.
- Oshkosh Truck Corp., Oshkosh, Wis. \$2,268,068. Production of aircraft towing tractors. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0184.
- Federal Electric Corp., Paramus, N.J. \$2,098,677. Engineer, furnish and install a communication control system and associated equipment at Vandenberg AFB, Calif. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. AF F34601-68-C-8195.
- Littion Systems, Inc., Woodland Hills, Calif. \$1,489,750. Repair of components of the inertial navigation system applicable to F-4 aircraft. Duluth, Minn. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. AF F04806-67-A-0478.
- 3—Applied Technology, Inc., Palo Alto, Calif. \$1,460,000. Production of radar receiving system ER-168 and associated equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-10001.
- ITEK Corp., Lexington, Mass. \$1,578,250. Development of a 48-inch telescope system. Air Force Eastern Test Range, Patrick AFB, Fla.
- Western Electric, New York, N.Y. \$1,649,500. Engineering services for the overseas automatic voice network. Waltham, Mass. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 19628-68-C-0260.
- 4—Littion Systems, Woodland Hills, Calif. \$1,450,677. Supplies and services for the installation of inertial guidance systems in VC-137 aircraft. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. F04606-67-A-0478
- International Harvester Co., San Diego, Calif. \$2,827,618. Turbine driven electrical power plants and generator sets. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. F04606-68-D-0043.
- General Electric, West Lynn, Mass. \$2,500,000. J-64 aircraft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0713.
- 9—Collins Radio Corp., Dallas, Tex. \$5,672,750. High-frequency, single side band radios. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 68-C-0164
- Batesville Mfg. Co., Camden, Ark. \$1,300,000. Bomb dispensers and containers. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-1094
- Boeing Co., Seattle, Wash. \$1,492,500. Minuteman missiles. Space & Missile Systems Organization (AFSC), Los Angeles, Calif. AF 04701-68-C-0165.
- 10—Boeing Co., Wichita, Kan. \$1,843,528. Spare parts for B-52 aircraft. Oklahoma City Air Materiel Area, (AFLO), Tinker AFB, Okla. F34601-68-C-1902.
- 11—Hallcrafters Co., Rolling Meadows, Ill. \$2,050,000. Electronic countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1015.
- 12—Hallcrafters Co., Rolling Meadows, Ill. \$1,030,746. Production of electronic equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0079
- 15—United Aircraft, West Palm Beach, Fla. \$2,942,500. Work on an advanced propulsion system control. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1207.
- Littion Systems, Woodland Hills, Calif. \$1,391,373. Spare parts for F-111 navigational instruments. Duluth, Minn. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. F04606-68-A-0147.
- Boeing Co., Wichita, Kan. \$1,353,125. Collection and analysis of data relative to the Low Altitude Clear Air Turbulence program. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1468.
- 16—Marwal Steel Co., Richmond, Calif. \$2,161,395. Steel arch aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33601-68-C-0849.
- Republic Aviation, Farmingdale, N.Y. \$1,211,000. Engineering services for F-105 aircraft. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. F04606-68-C-0300-0008.
- M.I.T., Cambridge, Mass. \$3,000,000. Research on advanced inertial sensor techniques. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1155.
- 17—Continental Aviation & Engineering Corp., Detroit, Mich. \$1,111,680. Production of J-69 aircraft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0891.
- 18—Cable Corp., San Diego, Calif. \$4,145,215. Production of navigation equipment for RF-4C and B-57 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0011.
- 22—McDonnell Douglas Corp., Tulsa, Okla. \$2,641,763. Rehabilitation of Air Force Plant Number Three, Tulsa, Okla. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- 23—Thiokol Chemical Corp., Bristol, Pa. \$4,747,500. Production of Stage I Minuteman missile motors. Brigham City, Utah. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04-684-926.
- 24—Aerofet General, Downey, Calif. \$5,799,358. Production of anti-personnel munitions. Batesville, Ark. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-68-C-0922.
- 25—General Electric, Burlington, Vt. \$1,290,120. Aircraft armament. Warner-Robins Air Materiel Area, (AFLO), Robins AFB, Ga. AF 09603-68-C-1997.
- C. H. Koch & Sons, Corte Madera, Calif. \$2,000,000. Survival kit containers for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F-33657-68-C-1024.
- Olin Mathieson Corp., New York, N.Y. \$1,814,880. Operation of Air Force Plant Number 80 and for production of missile propellant. Saltville, Va. San Antonio Air Materiel Area, (AFLO), Kelly AFB, Tex. F41608-68-D-0401.
- 30—Applied Technology, Inc., Palo Alto, Calif. \$1,875,900. Engineering and installation of 14 channel video tape recorders on F-105 aircraft. Sacramento Air Materiel Area, (AFLO), McClellan AFB, Calif. F04606-67-A-1818.

Army Munitions Command Continues RDT&E

(Continued from Page 36)

need, requires an exploratory development effort or task to bring about its solution.

The system of QMDO planning, a fairly recent development of the Department of the Army, is suffering from growing pains. It appears, however, to show considerable benefit as a management tool for determining the most promising technical directions, and also as a vehicle for improving technical communications.

Determining Technical Progress.

With well defined objectives and technical approaches, and detailed task descriptions of exploratory development work to be performed, the job of following the progress of technical accomplishment should not be an arduous one. The network structure, supported by narrative descriptions of planned effort, provides alternate avenues for overcoming technical voids. The estimate of success associated with each of the avenues makes it possible for a manager to suggest changes in direction when the present course of action appears fruitless.

Summary

The research and exploratory development programs of the U.S. Army Munitions Command provide the technological base and, consequently, are the backbone of the entire RDT&E munitions program. Continued emphasis on both policy and program planning of these efforts is required to support the development of effective, safe and reliable munitions systems.

Mid-management's role in long and short range planning is the careful development of policy and its implementation. To enhance productivity in research and exploratory development, such factors as the definition of threat, information needs relative to materiel/system deficiencies, and mission objectives must be considered.

The entire process of planning in research and exploratory development involves solutions to such problems as facility needs, research program balance, and determining means to indicate the most promising directions.

Use of DD Form 250 Now Mandatory for Defense Contractors

The Defense Supply Agency has announced that DD Form 250, Material Inspection and Receiving Report, is now mandatory and must be used by all contractors making shipments to the Government.

A supply of the new forms, which came into use early in 1967, is now available to defense contractors at the Defense Contract Administration Services (DCAS) office indicated in each contract.

DD Form 250 is used to record the most important information of the procurement process. It contains such information as the identification of the contract, the buyer, the contractor and the government administrator. The form also contains the location of points of shipment, office of payment and the terms of discount and, finally, the certification of inspection and acceptance by the Government.

One of the most beneficial uses of the new form is that it can serve as a demand for payment when four copies are stamped "Invoice" and mailed to the payment office cited in the contract. This eliminates the need for contractors to prepare a special commercial invoice.

When the item or items are inspected and accepted at a defense contractor's plant, the contractor should immediately send for copies stamped "Invoice" to the cognizant Defense Contract Administration Services Region (DCASR). He can expect payment within 10 to 14 days.

The form is made up as a hectograph master sheet for reproduction. When the information is typed or written in the blocks, the master sheet is imprinted so that it can be used by the contractor for reproduction on an ordinary spirit-gelatin machine. A variation of the form comes with six carbon tissues attached to the hectograph master sheet to allow for immediate use of the six carbons.

Information on the use of DD Form 250 can be found in Defense Procurement Circular Number 59, dated Feb. 14, 1968, which is available to contractors from Defense Contract Administration Services offices.

DSA Updates Engineer Drawing Repository Directory

The Defense Supply Agency has issued an updated version of its Directory of DOD Engineering Drawing Repositories, TD-1, incorporating information changes and additions which have occurred since the first issue in 1964.

TD-1 provides the names and addresses of DOD data repository sites; information regarding availability, limitations and requisitioning procedures; and, generally, the categories of items for which drawings are maintained.

The directory is intended for use by DOD activities and other agencies of the Government as a reference guide to potential sources of engineering information required in support of assigned missions.

It may also be useful to defense contractors whenever the terms of their contracts of formal agreements with government procuring activities specifically authorize acquisition of such repositored data.

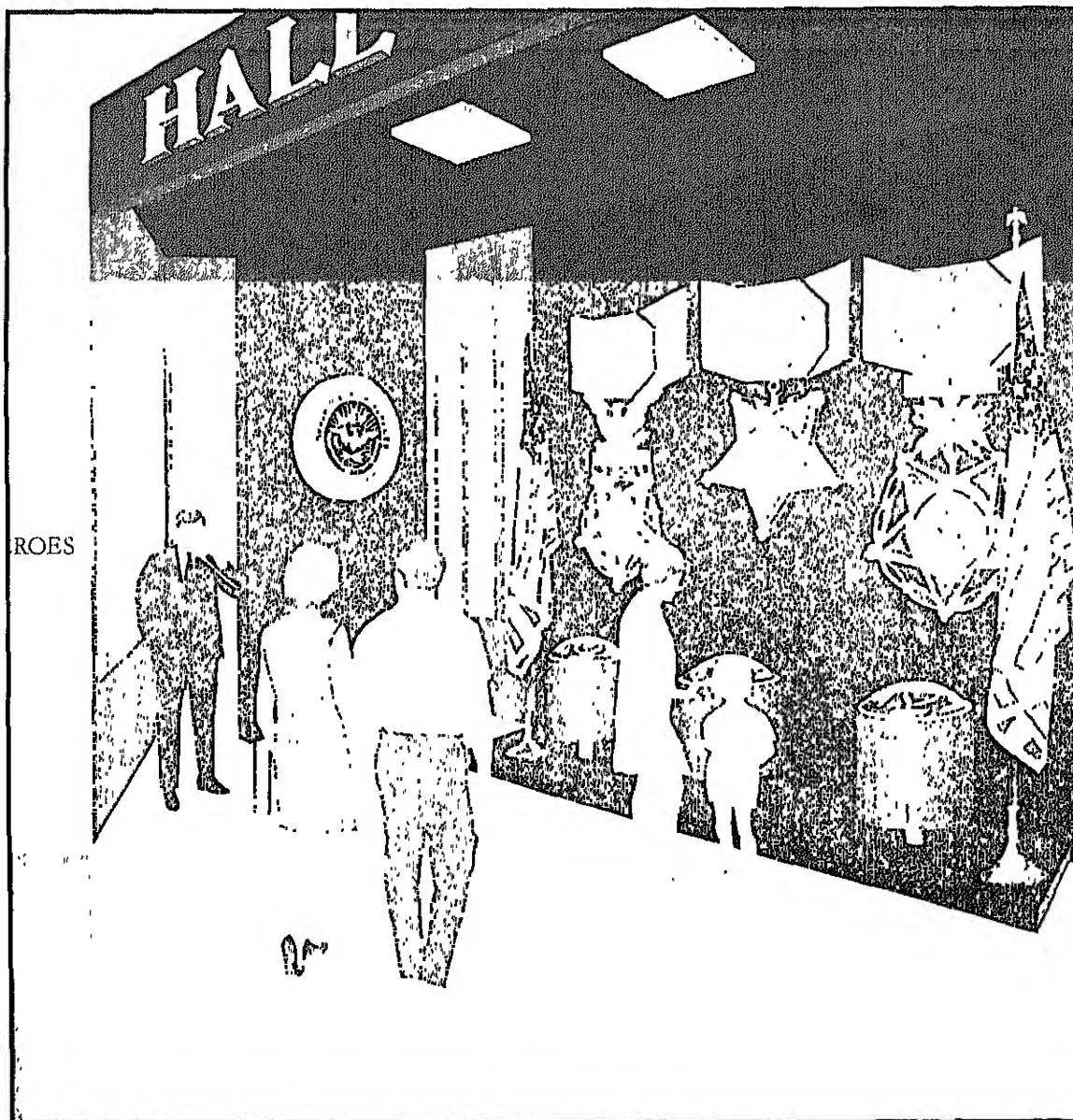
Copies of the directory may be obtained from the Naval Supply Depot, 5801 Tabor Ave., Philadelphia, Pa. 19111.



DEFENSE INDUSTRY BULLETIN

Vol. 4 No. 7

July 1968



Hall of Heroes—The Pentagon

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor, Telephone queries: (202) OXford 5-2709.

The *Bulletin* is distributed without charge each month to representatives of industry and agencies of the Department of Defense, Army, Navy and Air Force. Subscription requests should be made in writing on letterhead and addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301.

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Subcontracting and Small Business

Clyde Bothmer

The Small Business Act places on all government procurement agencies and the Small Business Administration (SBA) the responsibility to insure that "a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government" is placed with small business enterprises. The reference to subcontracts has become increasingly significant in recent years.

Between 1954 and 1961, the percentage of Defense Department contract awards in the United States received by small businesses dropped from 25.3 percent to 15.9 percent. Principal reasons for this change are varied, but can be deduced readily from the figures available. In 1952, defense spending was at a peak for the Korean conflict, at about \$40 billion; by 1954, expenditures had declined to slightly more than \$10 billion. Small business absorbed a portion of this reduction but retained about a quarter of the defense prime contract dollars as mentioned before, and as shown in Figure 1 on page 2. As the defense dollars increased after 1954, however, the dollar amount which went to small business remained fairly constant, and the share of small business in these government contracts diminished.

Several causes might be suggested for the static small business situation in these years, but two seem particularly significant: large firms were forced to compete for contracts usually within the small business sphere, in order to maximize plant utilization; and the increasing complexity of modern weaponry, combined with the trend to the procurement of total systems from a single prime contractor, tended to close the market to small businesses whose resources were inadequate for tasks of such magnitude.

It is to the latter problem that the subcontracting program required by Public Law 87-305, passed in September 1961, is directed. By this Act the Congress required the Small Business Administration, the Defense Department, and the General Services Administration to develop, jointly and cooperatively, a small business subcontracting program. By December of that year, the agencies reached agreement on 15 principles which were incorporated into the Armed Services Procurement Regulation (ASPR) and the Federal Procurement Regulations (FPR).

The ASPR provisions for the sub-

contracting program, applicable to all contracts except those to be performed entirely outside of the United States or for personal services, divide procurements into two groups: those ranging from \$5,000 to \$500,000, and those over \$500,000. (Contracts under \$5,000 do not offer significant opportunity for subcontracting). Contracts which fall into the first category include a "best efforts" clause; the contractor agrees to accomplish the maximum amount of subcontracting to small businesses that he "finds to be consistent with the efficient performance" of the contract. In procurements over \$500,000, the contractor is required by a mandatory contract clause to undertake a full small business subcontracting program with the specific responsibility to:

- Designate a small business liaison officer.
- Give consideration to small business on "make or buy" decisions.
- Offer small business an equitable opportunity to compete for subcontracts.
- Maintain detailed records of subcontracts in excess of \$10,000.
- Prepare and submit specific reports to the appropriate buying agency.
- Pass on similar responsibilities to major subcontractors.

These contractual requirements in themselves, however, were inadequate to assure enthusiastic participation in the program. Also, the regulations were being applied across the board in a general way, while the need was for selective effort in areas where a substantial return might be expected. Recognizing these needs, SBA and DOD jointly launched the Voluntary Subcontracting Program.



Clyde Bothmer is a Deputy Associate Administrator of the Small Business Administration. Before joining SBA in 1966, he was Executive Secretary of the Defense Industry Advisory Council of the Defense Department. He is a graduate of the University of Iowa and the Iowa College of Law.

The initial proposal of this program, which would be unrelated to prime contractors' legal obligations, was made by a joint letter from Administrator John E. Horne of the SBA and Assistant Secretary of Defense (Installations and Logistics) Thomas D. Morris. The letter was forwarded on May 3, 1963, to the 25 defense prime contractors who received the highest net value of the prime contract awards in FY 1962. All of the firms agreed to participate in the program. On Dec. 4, 1964, another letter was sent by Administrator Eugene P. Foley and Assistant Secretary Morris, inviting additional firms to participate. With recent additions, one firm at its own initiative, the total number of participants rose to 37 (there would have been 39 but for 2 mergers of member firms).

Under this program the prime contractor assumes the greatest portion of the responsibility. Members agree to:

- Identify commodities and services for which small businesses are not presently solicited.
- Provide to SBA the data necessary to develop new sources (*e.g.*, drawings, technical descriptions, specifications, etc.).
- Review specifications for revision, when feasible, so that small firms will not be excluded by unnecessarily restrictive requirements.
- Advise procuring agencies of specifications or contract provisions which appear to be unnecessarily restrictive.
- Advise small firms on procedures for acceptance for the Qualified Products List.

On the Government's part, SBA attempts to discover new small business sources for industry, conferring with prime contractors on needs, requirements and plans. Also, the Defense Department, through its contract administration offices, provides review of the contractor's policy and practice in this area, both to assure adherence to ASPR provisions regarding small business, and to encourage new ideas for the furtherance of the program.

Between 1964, the first full year of the Voluntary Program, and 1967, the small business share of the total of military subcontracts rose from 39.1 percent to 43.3 percent. This represents a growth of about 10.7 percent in four years. Also, the growth appears to be totally resultant from the

Voluntary Subcontracting Program, which is made up of only 37 of approximately 600 firms that provide the base for these figures. Subcontracts let by members of the program show an increase in the small business share from 34.8 percent to 40.5 percent in the same period, a growth of about 16.4 percent. The small business share of subcontracts awarded by non-participants in the Voluntary Program increased less than 2 percent in the same period.

This success has given impetus to an effort to expand the program to cover 35 more of the largest of DOD prime contractors. An invitation letter, signed by Administrator Robert C. Mool and Assistant Secretary Morris, was sent out on March 14, 1968. This final round of invitations will complete the coverage of those members of the "Top 100" DOD contractors which are considered to offer substantial subcontracting potential. Since the Top 100 accounted for 65.5 percent of the total dollar value of military prime contracts over \$10,000 in FY 1967, and all other large prime contractors (some 300 corporations) received only 14.2 percent of the total dollar value, any further extension of the Voluntary Program would be of dubious value. If the subcontracting program is to continue to show gains, therefore, the SBA must develop new approaches to the issue.

One means of enlarging the present efforts without excessive personnel requirements is to place an increasing reliance upon review of contractors' subcontracting programs, while disengaging SBA from active participation in those programs.

The Defense Department has implemented the subcontracting program in the ASPR, as discussed earlier, and retains responsibility for assuring that its prime contractors discharge their obligations under the subcontracting clauses as under any other element of the contracts. At the same time, SBA has the responsibility of obtaining information as to the methods and practices utilized by prime contractors, and to report to the Congress on the accomplishment of small business programs. In order to minimize the impact of these responsibilities on the prime contractors, SBA plans to participate with the Defense Department in reviews of contractors, utilizing mutual information to the greatest extent possible.

The review by SBA will be directed toward three purposes:

- To determine the extent of compliance with the prime contractor's contract obligations at a specific purchasing activity.
- To obtain information on the procurement methods and practices of the prime contractor, and the extent

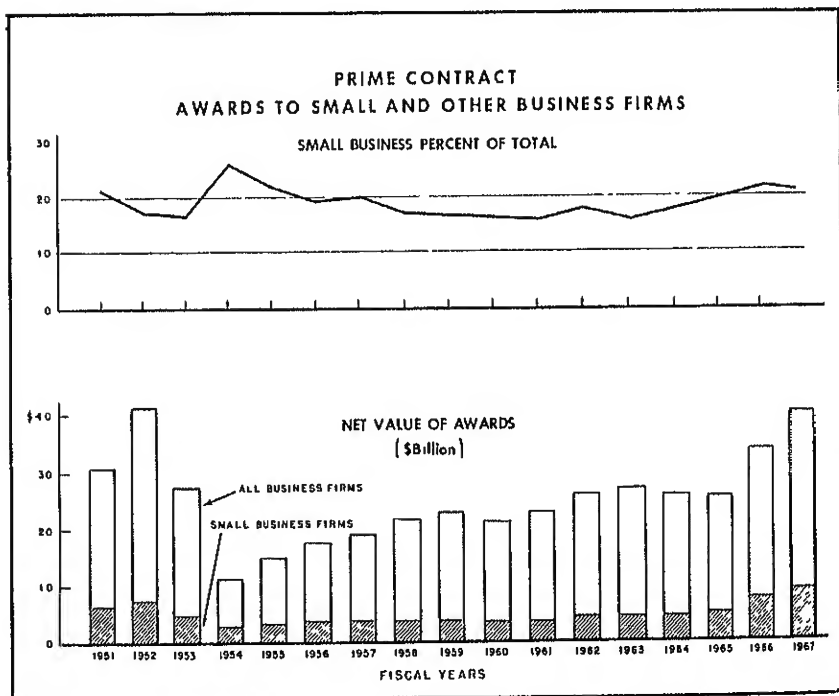


Figure 1.

U.S. Government
SMALL BUSINESS ADMINISTRATION

Washington, D. C.

April 9, 1968

Lt. Commander E. W. Bradford
Office of the Assistant Secretary
of Defense (Public Affairs)
Pentagon, Room 1E764
Washington, D. C. 20301

Dear Commander Bradford:

With this letter I am submitting the first of a series of articles which you may, pursuant to our discussions, wish to publish in the *Defense Industry Bulletin*. Each of these will deal with a specific aspect (program) of the Small Business Administration.

The subcontracting program has been selected as the first in the series because it is, perhaps, of the greatest interest to your "subscribers."

As you know, the program activities of the Small Business Administration are grouped into three major areas under three Associate Administrators for: Financial Assistance; Investment; and Procurement and Management Assistance. This series will deal only with the procurement assistance and management assistance areas and, in the order of their appearance, will include:

SBA's Subcontracting Program
SBA's Prime Contracting Program
SBA's Management Counseling Program
SBA's Management Training Program
SBA's Technology Utilization Program
SBA's Size Standards Program

Not so long ago, I heard a high-ranking government official express a philosophy which struck me as very significant. He made the point that a governmental agency has a positive duty to educate those segments of the populace potentially interested in its programs; for to fail to do so is to discriminate in favor of those with knowledge and against those without. SBA's programs are not as well known as we would like them to be, and we are, therefore, grateful to you for helping us carry out our duty to inform a segment of the public which is directly or indirectly involved in each of the programs to be described.

Sincerely yours,

CLYDE BOTHMER
Deputy Associate Administrator

of his subcontracting to small business.

- To evaluate the prime contractors' subcontracting programs so that the findings may be utilized by contracting officers in determining allowable profit in negotiated contracts.

In order to complete each review in a manner which will achieve its purposes, SBA has developed a set of questions for which the reviewing officer will seek answers. The questions are based on the requirements of the subcontracting clauses of the company's government contract and, in addition to obtaining desirable factual data, are directed toward determining whether the contractor has:

- Implemented a real small business subcontracting program, in fact as well as on paper.

- Committed himself to the program, giving attention to it at appropriate levels of management.

- Kept the program alive and known in the organization after initial establishment.

- Established procedural steps which assure opportunities for small business bidders.

- Developed plans and goals for maximum small business participation and capability for appraising progress.

- Declared and observed policies consistent with and supporting his obligations under the small business subcontracting clauses of the contracts.

At the conclusion of the review, a summary of the findings and recommendations will be provided to the contractor, and to the Defense Documentation Center. The material is then available to contracting officers who are developing weighted guidelines for profit on negotiated contracts. Small business subcontracting is a factor under "contractor performance."

Neither contract provisions and reviews, nor voluntary effort will be to any point, however, if there are no qualified small businesses bidding on contracts. To assure continued availability of such bidders and to increase their number, SBA is instituting "Project Upgrade." The purpose of Project Upgrade is to give interested small businessmen the opportunity to compete effectively for subcontracts within their manufacturing capabilities. This will be done by individual counseling, literature, management

courses, and jointly sponsored conferences. It will be the responsibility of the subcontracting specialist, in the SBA Area Office, to identify firms needing and desiring this service, identify problem areas, provide individual counseling, recommend individual counseling by regional team or SCORE, (SBA's Service Corps of Retired Executives which will be discussed in a subsequent article), and recommend the use of scheduled courses and conferences.

Candidates for this particular assistance program will be obtained in four ways:

- Prime contractors may advise small businesses, which fail to qualify as subcontract bidders, to seek assistance from SBA.

- Potential subcontractors will be identified by SBA personnel in the course of the Facilities Inventory Program (surveys to discover new, small business, industrial capability).

- Subcontracting specialists will recommend participation to businessmen contacted in the normal course of other duties.

- Regional Offices will refer potential subcontractors which appear in the regular course of assistance efforts administered at the Regional Office.

When a firm has been selected for assistance, the subcontracting specialist at the SBA Area Office will conduct a thorough analysis of the firm

to determine deficiencies. Areas of study will include, as necessary, production, finance, facility, quality control, administration, management, sales and services. When the problem areas which prevent the firm's qualification as a subcontractor have been identified, the specialist will determine which SBA assistance programs will aid in the solution of the problems and he will supply or recommend that help, as appropriate. The specialist will provide to the cognizant Regional Office the names of firms, a statement of the assistance required, and a copy of his report analyzing company needs and recommended solutions.

When a firm has completed the recommended management training, conducted by Regional Offices, and has been provided counseling which is desirable, a report of the results, negative and positive, will be forwarded to the Area Office. There, the subcontracting specialist will be responsible to review the results and, where applicable:

- Determine the firm's area of capability.

- Refer the firm to prime contractors who have a current or future need for the product or service being supplied by the firm.

- Supply the firm with names of appropriate people to contact in sales efforts.

- Assure that the firm's capabilities

are made known to Facilities Inventory personnel.

- Suggest that the small firm request the prime contractor, which previously rejected the firm, to reconsider the company as a subcontractor.

Project Upgrade will broaden the small business base from which prime contractors may select. Their responsibilities under the Voluntary Program and under their contracts should be lighter if the number of qualified small business bidders is increased. The SBA, on the other hand, will be able to place its emphasis upon direct assistance to small businesses, utilizing currently operational services, instead of the circuitous means which constituted the primary approach previously. Review will continue to be necessary but it will be oriented to observation and cooperative assistance rather than to an audit function.

The subcontracting program, as applied through the efforts described herein, should contribute significantly to achieving the goals of the Congress described early in this article. Additional benefits will be realized as well, by the nation as a whole, since this same program serves to introduce cost-reducing competition of defense contracts; to expand the base of the country's defense-production capability; and, by improving the performance and opportunity of small businesses, to strengthen the national economy.

Small Business Administration

Listing of Area and Regional Offices

NORTHEASTERN AREA
Boston, Mass. 02203
John Fitzgerald Kennedy Federal
Bldg.

Government Center

Augusta, Me. 04330
Federal Bldg., U. S. Post Office
40 Western Ave.

Boston, Mass. 02203
John Fitzgerald Kennedy Federal
Bldg.
Government Center

Concord, N. H. 03301
55 Pleasant St.

Hartford, Conn. 06103
Federal Office Bldg.
450 Main St.

Montpelier, Vt. 05601
Federal Bldg.
87 State St.

Providence, R. I. 02903
Smith Bldg.
57 Eddy St.

NEW YORK AREA
New York, N. Y. 10006
61 Broadway

Hato Rey, P. R. 00919
255 Ponce De Leon Ave.
P. O. Box 1915

New York, N. Y. 10004
42 Broadway

Newark, N.J. 07102
970 Broad St.

Syracuse, N. Y. 13202
Hunter Plaza, Fayette & Salina Sts.

MIDDLE ATLANTIC AREA
Bala Cynwyd, Pa. 19004
1 Decker Square

Baltimore, Md. 21201
Federal Bldg.
31 Hopkins Plaza

Clarksburg, W. Va. 26301
Lowndes Bank Bldg.
119 N. 3rd St.

Cleveland, Ohio 44113
Standard Bldg.
1370 Ontario St.

Columbus, Ohio 43215
Beacon Bldg.
50 W. Gay St.

Louisville, Ky. 40202
Commonwealth Bldg.
Fourth & Broadway

Philadelphia, Pa. 19107
1317 Filbert St.

Pittsburgh, Pa. 15222
Federal Bldg.
1000 Liberty Ave.

Richmond, Va. 23226
1904 Byrd Ave.
P. O. Box 8565

Washington, D. C. 20417
1321 H St. NW

SOUTHEASTERN AREA

Atlanta, Ga. 30309
1401 Peachtree St. NE

Atlanta, Ga. 30303
52 Fairlie St. NW

Birmingham, Ala. 35205
908 S. 20th St.

Charlotte, N. C. 28202
American Bldg.
201 S. Tryon St.

Columbia, S. C. 29201
1801 Assembly St.

Jackson, Miss. 39201
U. S. Post Office & Courthouse Bldg.
Capital & West Sts.

Jacksonville, Fla. 32202
Federal Office Bldg.
400 W. Bay St.
P. O. Box 35067

Miami, Fla. 33130
Federal Office Bldg.
51 SW First Ave.

Nashville, Tenn. 37219
Security Federal Savings & Loan Bldg.
500 Union St.

MIDWESTERN AREA

Chicago, Ill. 60604
Federal Office Bldg.
219 S. Dearborn St.

Chicago, Ill. 60604
Federal Office Bldg.
219 S. Dearborn St.

Des Moines, Iowa 50309
New Federal Bldg.
210 Walnut St.

Detroit, Mich. 48226
Book Bldg.
1249 Washington Blvd.

Indianapolis, Ind. 46204
Century Bldg.
36 S. Pennsylvania St.

Kansas City, Mo. 64106
911 Walnut St.

Madison, Wis. 53703
25 W. Main

Minneapolis, Minn. 55402
Reimann Bldg.
816 Second Ave. S.

St. Louis, Mo. 63102
Federal Bldg.
208 N. Broadway

SOUTHWESTERN AREA

Dallas, Tex. 75202
1309 Main St.

Albuquerque, N. M. 87101
Federal Bldg.
500 Gold Ave. SW

Dallas, Tex. 75201
Mayflower Bldg.
411 N. Akard St.

Houston, Tex. 77002
Niels Esperson Bldg.
808 Travis St.

Little Rock, Ark. 72201
Post Office & Court House Bldg.
600 W. Capitol Ave.

Lubbock, Tex. 79401
Federal Office Bldg.
1616 Nineteenth St

Marshall, Tex. 75670
Travis Terrace Bldg.
505 E. Travis St.

New Orleans, La. 70130
Gateway Bldg.
124 Camp St.

Oklahoma City, Okla. 73102
Oklahoma Mortgage Bldg.
324 N. Robinson St.

San Antonio, Tex. 78205
Manion Bldg.
301 Broadway

ROCKY MOUNTAIN AREA

Denver, Colo. 80202
721 Nineteenth St.

Casper, Wyo. 82601
Western Bldg.
300 N. Center St.

Denver, Colo. 80202
Federal Office Bldg.
1961 Stout St.

Fargo, N. D. 58102
American Life Bldg.
207 N. Fifth St.

Helena, Mont. 59601
205 Power Block
P. O. Box 1690

Omaha, Neb. 68102
Federal Building
215 N. Seventeenth St.

Salt Lake City, Utah 84111
Federal Bldg.
125 State St.

Sioux Falls, S. D. 57102
National Bank of South Dakota Bldg.
8th & Main Ave.

Wichita, Kansas 67202
120 S. Market St.

PACIFIC COASTAL AREA
San Francisco, Calif. 94102
Federal Bldg.
450 Golden Gate Ave.

Anchorage, Alaska 99501
632 Sixth Ave.

Boise, Idaho 83702
Idaho Bldg.
216 N. Elgth St.

Honolulu, Hawaii 96813
1149 Bethel St.

Los Angeles, Calif. 90014
849 S. Broadway

Phoenix, Ariz. 85004
Central Towers Bldg.
2727 N. Central Ave.

Portland, Ore. 97205
921 SW Washington St.

San Diego, Calif. 92101
110 W. C St.

San Francisco, Calif. 94102
Federal Bldg.
450 Golden Gate Ave.

Seattle, Wash. 98104
Smith Tower
506 Second Ave.

Spokane, Wash. 99210
U. S. Court House
P. O. Box 2167

DSA Assigned Government-Wide Fuel Purchasing

The Defense Supply Agency has been assigned responsibility for procurement of all fuel and petroleum products used by civil agencies of the Federal Government.

Responsibility for civil agency support will be transferred from the General Services Administration to the Defense Supply Agency on a progressive basis over a 16-month period beginning July 1.

The Defense Supply Agency will handle the procurement through the Defense Fuel Supply Center, Alexandria, Va., which purchases fuel and petroleum products for all the Military Services.

Annual procurement savings amounting to about \$2.5 million are expected to result from the common support of all Federal Government activities by the Defense Fuel Supply Center.

The Defense Supply Agency currently procures more than \$1.6 billion annually in fuel products for the military. Civil agencies of the Federal Government currently procure about \$99.9 million annually.

Electronic Teletype May Soon Join Fleet

An electronic teletype system may soon become a standard item in the Navy's air fleet.

The unit consists of three major subassemblies: an electronic keyboard, an edit-display unit and a page printer. The subassemblies can be separated to perform remotely from each other.

The edit-display unit permits the operator to type out a message, correct it and insert it into the memory of the system, to be transmitted later. The memory holds up to 10,000 words.

With proper interface, the page printer can print 50,000 words per minute, using a fiber optic cathode ray tube for non-impact printing on sensitized paper. The electronic system is also capable of standard 100-word-per-minute teletype transmission.

When connected to a converter, the equipment can also receive and print information from an analog computer containing anti-submarine warfare and oceanographic data.

Hall of Heroes Opens in Pentagon

To honor the more than 3,200 recipients of the Congressional Medal of Honor, the Defense Department has opened a shrine room in the Pentagon, called the Hall of Heroes (see cover art).

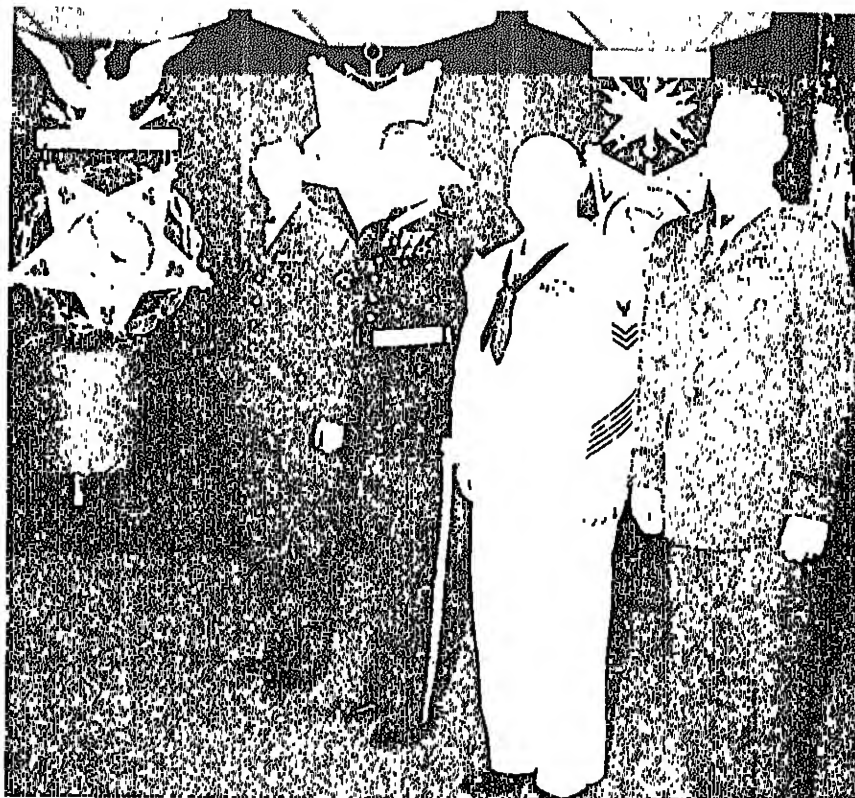
The hall was dedicated by President Lyndon B. Johnson May 14 during a ceremony attended by Secretary of Defense Clark Clifford, the Secretaries of the Army, Navy and the Air Force, the members of the Joint Chiefs of Staff, members of Congress and past medal winners.

The ceremony was highlighted by the presentation of the Medal of Honor by President Johnson to four combat veterans of the Vietnam war. The historic occasion marked the first time that the medal was presented to a member of each of the four Armed Services during the same ceremony.

Plaques bearing the name of every serviceman, who has won the nation's highest award for heroism in the past 100 years, line the wall of the Hall of Heroes. Huge reproductions of the Medal of Honor are also on display as well as the actual medals. Recorded messages giving the history of the award are provided via telephone receivers.

In the past, 2,215 medals have been presented to soldiers, 731 to navymen, 245 to Marines, 46 to airmen and 1 to a coast guardsman. Thirty-seven medals, including the awards made during the dedication, have been presented to heroes of the Vietnam war.

The Hall of Heroes is located in the "A" ring of the Pentagon at the end of the corridor from the Mall entrance.



Four Congressional Medal of Honor winners are on hand during dedication ceremonies of the Pentagon's Hall of Heroes. The four received their medals from President Johnson earlier in the proceedings. Winners are: (left) Specialist Five Charles C. Hagemeister, USA, Lincoln, Neb.; Sergeant Richard A. Pittman, USMC, Stockton, Calif.; Boatswain's Mate First Class James E. Williams, USN, Darlington, S.C.; and Captain Gerald O. Young, USAF, Anacortes, Wash.



MEETINGS AND SYMPOSIA

JULY

International Conference on Crystal Growth, July 15-19, at the University of Birmingham, England. Sponsors: Air Force Cambridge Research Laboratories, U.K. Ministry of Technology, International Committee on Crystal Growth and the International Union of Pure and Applied Physics. Contact: Charles S. Sahagian (CRWB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730. Phone (617) 274-6100, Ext. 3298.

High Temperature Chemistry Research Conference, July 29-Aug. 2 at Crystal Inn, Wash. Sponsor: Office of Aerospace Research. Contact: Dr. George Parks, Dept. of Chemistry, University of Rhode Island, Kingston, R. I. 02881.

Aurora and Airglow Conference, July 29-Aug. 10, at the Agricultural College of Norway, As, Norway. Sponsors: Office of Aerospace Research, Office of Naval Research, DASA and the Air Force Cambridge Research Laboratories. Contact: Mr. K. W. Champion, Air Force Cambridge Research Laboratories (CRUB), L. G. Hanscom Field, Mass. 01730. Phone (617) 274-6100, Ext. 3033.

AUGUST

International Federation for Information Processing (IFIP) International Conference, Aug. 5-10, at Edinburgh, Scotland. Sponsor: Office of Aerospace Research. Contact: Mrs. R. W. Swanson, Air Force Office of Scientific Research (SR), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5407.

Space Maintenance and Extra-Vehicular Activities Second National Conference, Aug. 6-8, at Las Vegas, Nev. Sponsors: Air Force Aero Propulsion Laboratory, Ling-Temco-Vought and NASA. Contact: Mr. Clodfelter (APFT), Wright-Patterson AFB, Ohio

45433. Phone (513) 357-1110, Ext. 55875.

Second International Liquid Crystal Conference, Aug. 12-16, at Kent, Ohio. Co-sponsors: Office of Scientific Research and Kent State University. Contact: Lt Col. E. T. Walford, Office of Aerospace Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5337.

Physiological Basis for Human Work Performance Symposium, Aug. 24, at Boston University. Sponsors: Army Research Institute of Environmental Medicine, Boston University and the American College of Sports Medicine. Contact: Dr. Ralph F. Goldman, Dir., Military Ergonomics Laboratory, Army Research Institute of Environmental Medicine, Natick, Mass. 01760.

Physiological Sciences Twenty-Fourth International Congress, Aug. 25-30, in Washington, D.C. Sponsor: Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5041.

Fifth International Congress on Photobiology, Aug. 26-31, at Dartmouth College, Hanover, N.H. Sponsor: Office of Aerospace Research. Contact: Dr. R. B. Stevens, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20428. Phone (202) 961-1200.

SEPTEMBER

Fifteenth Technical Meeting of the AGARD Avionics Panel on Techniques for Data Handling in Tactical Systems, (dates undetermined), at Amsterdam, Netherlands. Co-sponsors: AGARD and NATO. Contact: Dr. Irving J. Gabelman, Program Chairman, Advanced Studies Group, Rome Air Development Center (EMD), Griffiss AFB, N.Y. 13440. Phone (315) 330-7208.

International Conference on Temperature and Cold, Sept. 2-6, at As-

pen, Colo. Sponsor: Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5041.

International Conference on Light Scattering in Solids, Sept. 3-6, at New York University. Sponsor: Army Research Office-Durham. Contact: Dr. Charles Baghoshian, Physics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706. Phone (919) 286-2285, Ext. 34.

Solid Mechanics Symposium, Sept. 10-11, at Baltimore, Md. Sponsor: Materials Advisory Group of the Army Materiel Command. Contact: Joseph L. Bluhm, Technical Working Group on Materials, Army Materials and Mechanics Research Center, Watertown, Mass. 02173. Phone (617) 926-1900.

Tenth Annual Meeting of the Military Testing Association, Sept. 16-20, at San Antonio, Tex. Co-Sponsors: Military Testing Association and Aerospace Medical Div., Personnel Research Laboratory. Contact Mr. Fotis, Aerospace Medical Div., Personnel Research Laboratory, Lackland AFB, Tex. 78236. Phone (512) 674-3211, Ext. 36145.

Advanced Planning Briefing for Industry on Naval Ordnance/Missiles, Sept. 18-19, at Coronado, Calif. Classified Secret. Co-sponsors: Naval Materiel Command and the American Ordnance Association. Contact: Cmdr. A. D. Sullivan, USN (Ret.), American Ordnance Association, 17th and H Streets, N.W., Washington, D.C. 20006. Phone (202) 347-7250.

Aerodynamic Deceleration Systems Conference, Sept. 23-25, at El Centro, Calif. Co-Sponsors: Defense Department Joint Parachute Test Facility and the American Institute of Aeronautics and Astronautics. Contact: Earl C. Meyers, 6511th Test Group Parachute, Naval Air Facility, El Centro, Calif. 92243. Phone (714) 352-6642.

New Nozzle Improves Wind Tunnel at Arnold Engineering Development Center

A new nozzle is being used in one of the wind tunnels at the Air Force's Arnold Engineering Development Center in Tennessee to produce more accurate simulation of hypervelocity flight for tests of atmospheric re-entry vehicle models.

Development of the new nozzle was started by ARO, Inc., contract operator of the center, when inaccuracies were found in some of the data obtained in conical nozzle wind tunnels. Studies showed that the flow was not smooth and uniform when it passed over the model in the test section at the nozzle exit.

The wall of a wind tunnel nozzle must be shaped in a definite way so that the air or other test gas will accelerate to the desired speed and still be uniform. Before the new nozzle was developed, high-performance wind tunnels operating at Mach 20

were designed with conical, or straight, nozzle walls.

In a contoured nozzle, the nozzle wall is curved gently from the wind tunnel throat to the test section. The main problem in the design of the Mach 20 contoured nozzle was that the wind tunnel flow accelerated too fast and then had to slow down before it reached the model.

As the test gas slowed down, a non-uniform flow was created that could not be used for testing. It was found that the shape of the nozzle wall was extremely critical in part of the nozzle. Two nozzles were built and tested before sufficient design information was available to build the final nozzle.

With the nozzle, tests of hypervelocity flight vehicle models are producing precise data, which are projected to actual flight to provide accurate predictions of how full sized flight vehicles will perform.

Project Brilliant Puts Light on Target

An attack aircraft streaks across the dark night sky. Suddenly a brilliant light beams down from the plane, and trucks and troops on the ground are exposed in a light 500 times brighter than moonlight.

Such a scene could soon become reality as a result of "Project Brilliant," an Air Force program to develop a high intensity, pod-mounted ground illumination system.

Designed to fit an F-4 aircraft fuel pod, the illumination system is about 3 feet in diameter and 10 feet long. The complete unit, including generator, light system and fuel, weighs less than 2,000 pounds. The generator system weighs about 1,000 pounds and uses a magnetohydrodynamic (MHD) channel power supply.

Officials at the Aero Propulsion Laboratory, Wright-Patterson AFB,

Ohio, director of Project Brilliant, claim that the light power source could be doubled without substantially increasing the weight. A 2-megawatt illumination system would weigh about 3,000 pounds.

The Project Brilliant system uses a combination of jet fuel and oxygen for the modified Atlas vernier rocket engine used as a burner. Jet fuel is drawn from the aircraft system, and oxygen stored in the pod. Highly reliable, the illumination system has no moving parts.

Chrysler Corp. will integrate components of the system and build the MHD channel. Ground testing of a full-scale breadboard model will be conducted at the Arnold Engineering Development Center in Tennessee.

The Air Force expects the exploratory phase of the contract to be completed by the end of this year.

Satellite May Improve Aircraft Communications

An orbiting vehicle, equipped with a UHF teletype system capable of transmitting 60-word-a-minute messages over ground distances up to 8,000 miles, is being used by the Air Force in tests to improve communications between aircraft.

The orbiting vehicle for the tests is an experimental satellite (LES-5) developed by Lincoln Laboratory, Lexington, Mass. The satellite is equipped with a UHF repeater unit which translates and repeats all signals it receives on the "up" frequency to a different "down" frequency.

The extreme altitude of the satellite—20,000 miles—allows a line-of-sight that stretches nearly half-way around the world.

LES-5 was originated by the Air Force and Lincoln Laboratory for experimental use between air vehicles.

Engineering implementation for the current testing is being performed by the Deputy for Engineering, Aeronautical Systems Division, and the Air Force Avionics Laboratory of the Air Force Systems Command.

Eventually the system under study may be utilized by the Air Force and other defense elements for communications between attack aircraft flying at low levels and rear area air controllers; for an Air Force world-wide logistic control and status reporting system for logistic stores; and for strike and reconnaissance reporting.

The Navy and Army are also utilizing and testing similar UHF teletype systems in ships, submarines, naval aircraft, and Army quarter and half-ton vehicles.

Reminder

The Changing World of Electronics Conference and Exposition, Sept. 9-11, Sheraton Park Hotel, Washington, D. C. Sponsor: Institute of Electrical and Electronics Engineers. Contact: Mrs. Harriet H. Manley, Page Communications Engineers, Inc., 3300 Whitehaven St. NW, Washington, D. C. 20007, Phone (202) 337-7600.

Defense Documentation Center Reports

User Needs Study Results

Howard B. Lawson

The Defense Department spends approximately \$7 billion a year on research, development, test and evaluation of weapon systems. One of the by-products of a program of this magnitude is an avalanche of technical reports. There is a veritable treasure of scientific and technical information in this documentation.

A major problem in the design of an information system is to channel the required information to interested persons as efficiently as possible. The goal is to provide the right information to the right person, in the right form, at the right time. A first step in achieving this goal is to define the user's need and his procedures for acquiring technical information.

Several years ago the Defense Department undertook to study the users of its information system in two phases. Phase I treated the flow of scientific and technical information (flow process) within DOD. The study results were published in a report titled, "DOD User Needs Study, Phase I (Government Personnel)," referred to herein as Reference 1.

This article presents an overview of Phase II of the study which treated the flow process within the defense industry. It condenses the findings and conclusions of the investigation's final report titled, "DOD User Needs Study Phase II (Industrial Personnel)," (Reference 2). It also covers the summary and extension of the study's analysis provided in a supplemental report titled, "Flow of Scientific and Technical Information: The Results of a Recent Major Investigation," (Reference 3).

Phase II Study Approach

The objective of Phase II was to characterize the defense industry's scientific and technical information needs, and the flow process required

to satisfy these needs. The study's conclusions are as important to scientific and technical management as they are to those directly concerned with the flow process.

Useful scientific and technical information does not flow in a void. It flows from the interaction of people, their information needs, and their behavior patterns. A study of the flow process explores the dynamics of people, needs and behavior. Present



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The author gratefully acknowledges the assistance of Dr. Arnold F. Goodman, senior author of this investigation's final report and sole author of the analysis in Reference 3. He provided summary data for this article from his paper.

methodology does not prescribe a unique approach to the study of this dynamic communication problem. An analysis of currently available survey techniques indicated that an investigation of critical incidents would assure the acquisition of specific data on the flow process. Thus, the study data are based on specific experiences in the user's work environment, and not upon his opinions, judgments, or other generalities. To be eligible for the study, an incident must have been the most recently completed task that involved scientific or technical consideration, required a total of eight hours or more of the interviewee's effort, and had tangible and clearly identifiable output (e.g., a briefing or technical report). Each task then was divided into basic information units which permitted the resulting needs and behavior to be examined in detail.

Data were obtained by personal interviews with a representative sampling of 1,500 from a population of approximately 120,000 scientists, engineers and technical personnel. These personnel were employed by 73 companies, 8 research institutes and 2 universities which were contractors or grantees of DOD.

To ensure high-quality data, the interviewers were thoroughly trained, and the interviews were carefully recorded and checked for accuracy and consistency. The interviewers asked 63 questions in the following 4 subject areas:

- The user of scientific and technical information.
- The user's most recent scientific or technical task.
- The user's general utilization of the information system.
- The user's search and acquisition process for information used in task performance.

Many studies have been performed, and much has been written, concerning the information flow process. The tendency, however, has been to examine only small portions of the process, or to speculate about large portions of the process in generalities. Therefore, very little of a comprehensive, definitive and unifying nature has been said about the actual flow. The DOD User Needs Studies were the initial attempts to obtain data on so large a portion of the process. The Phase II analysis was the first attempt to draw definitive and unifying conclusions from such data.

The analytical approach of Phase II is summarized, as well as described in detail, both in Volume 2 of Reference 2 and in Reference 3. It will suffice here to observe that, in addition to the compilation of frequency distributions for the answers to a question or a pair of questions, a relationship analysis cycle has been followed. In this cycle, qualitative question responses were transformed into numerical form. Then a model for potential relationships among questions was constructed and estimated. Finally, the numerical relationship results were transformed back to qualitative form to yield significant input and output factors for the flow process.

Characterization of the Flow Process

The findings of the investigation, which characterize the flow process, are highlighted in this section. They are supported by the numerical results in Volume 3, Reference 2.

Type of Information Desired.

- Almost one-half of the information was in the engineering fields.
- Almost two-fifths of it was in scientific fields.
- In the conceptual-design and performance-production cycle, over 60 percent of the information involved design and performance.

Desired Media for Receiving Information.

- Oral information was wanted more than one out of three times.
- Semi-formally written information was wanted more than one out of three times.
- Over 60 percent of the information was desired in more than one document.

- Almost three-fifths of the time, a specific answer was needed.
- Over one-third of the time, a detailed analysis was needed.

First Source Contacted for Information.

- In 80 percent of the cases, either no search was required or the users first searched for information within the local work environment. (The "local work environment" extends only as far from the user as an internal company consultant. It does not extend as far from him as his organization's technical information center [library], which is his connection with the formal information system.)

Acquisition Time for Information.

- Almost one-half of the information was needed within 7 days.
- Almost three-fourths of it was needed within 30 days.
- Except for 5 percent of the information, the information needs were satisfied within the allowable acquisition time.

Utilization of Information.

- Over two-fifths of the information was used throughout the entire task.
- Over one-third of it was used in major portions of the task.
- Almost 80 percent of the information was absolutely essential to the task.

- Over 15 percent of it was extremely helpful in the task.

Utilization of the Formal Information System.

- Of the users, 95 percent utilized their organization's technical information center (library).
- Over 50 percent utilized it twice a month or more.
- Title listings or abstracts of information media would have been useful for finding more than two-fifths of the needed information.
- The Defense Documentation Center (DDC) was utilized by almost one-half of the users. On the other hand, DDC was unknown to almost one out of three of the users.¹
- The DDC Technical Abstract Bul-

¹ A recent review of the data by the author reveals that although 470 subjects indicated they did not know of DDC, 277 of these work for organizations which are among the top 100 users of DDC which annually request over 240,000 documents. It would appear that some of the subjects were unaware of the use that a corporate intermediary, such as the technical information center or library, actually makes of DDC. (See article, "Programs and Services of the Defense Documentation Center," Defense Industry Bulletin, April 1968, page 1.)

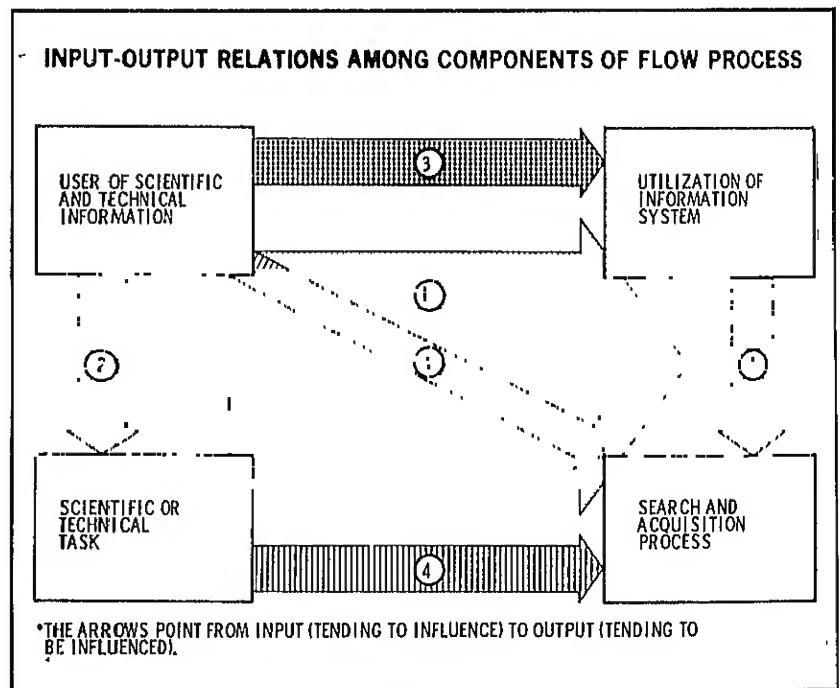


Figure 1.

letin (TAB) was utilized by less than two out of five users.

- TAB was unknown to over two out of five users.

- Less than 20 percent of the users utilized the National Aeronautics and Space Administration's Scientific and Technical Aerospace Reports (STAR).

- Over 60 percent of the users did not know of STAR.

- Over two out of five users encountered difficulties in the utilization of the information system within this frame of reference. Lack of timely awareness of information accounted for almost two-fifths of these difficulties. Lack of timely acquisition of information accounted for one-half of them.

Major Output of Assigned Scientific or Technical Tasks.

- More than 50 percent of the tasks were in engineering fields.

- More than 30 percent of them were in scientific fields.

- In the research-development-production cycle, almost two-thirds of the tasks were development.

- Two out of three tasks involved design and performance, within the conceptual-design and performance-production cycle.

Users of Scientific and Technical Information.

- Over one-half of the users held engineering positions.

- Almost one-third of them held scientific positions.

- In the research-development-production cycle, two out of three users occupied development positions.

- Of the users, 40 percent were not managers.

- Over 30 percent managed from one to five persons.

- More than one-half of the users possessed a bachelor's degree.

- Almost one-third of them possessed an advanced degree.

Flow Process from an Input/Output Point of View.

For design and analysis of the flow process, it is meaningful to consider the flow process from an input/output point of view (Figure 1). Input represents "tendency to influence," output represents "tendency to be influenced," and an arrow represents "the tendency of influence from input to output."

The components of the flow process are *user*, *task*, *utilization*, and *search and acquisition*. For the flow process in general, *user* and *task* act as input components; and *utilization* and *search and acquisition* act as output components (Arrow 1 in Figure 1). The other input/output relations among components of the flow process have the following:

- *User* as input component, and *task* as output component (Arrow 2 in Figure 1).

- *User* as input component, and

utilization as output component (Arrow 3 in Figure 1).

- *User*, *task*, and *utilization* as input components, and *search and acquisition* as output component (Arrows marked 4 in Figure 1).

Within each component, there are input factors and output factors. Factor represents "combination of related questions." Figure 2 presents the input and output factors for the flow process in general, which corresponds to Arrow 1 in Figure 1. For similar information on the input and output factors for *user*, *task*, *utilization*, and *search and acquisition*, see Reference 3.

One must realize, however, the statistical techniques of the analysis can merely characterize a relation. They cannot imply that a relation is cause-and-effect, for this can only be determined by a thorough understanding of the flow process.

Goals for the Flow Process

The conclusions of the investigation provide a set of goals for the flow process,² and a measure with which to evaluate a general information system. These goals are supported by the preceding characterization of the flow process, and the quantitative results which appear in Volume 3 of Reference 2.

The Flow Process.

Figure 3 is helpful in visualizing the goals described by the remainder of this section. It represents either of the following processes:

- The flow process in task performance, when *utilization* represents the utilization of the information system in task performance.

- The flow process in general, when *task* represents the user's scientific or technical task in general.

Bridge the Information Gap.

An information gap exists between the user of scientific and technical information, and the information system which serves his needs. This information gap must be bridged if the user is to obtain high-quality information.

² The goals for the flow process are a result of analysis performed subsequent to publication of Reference 2 and are contained only in Reference 3.

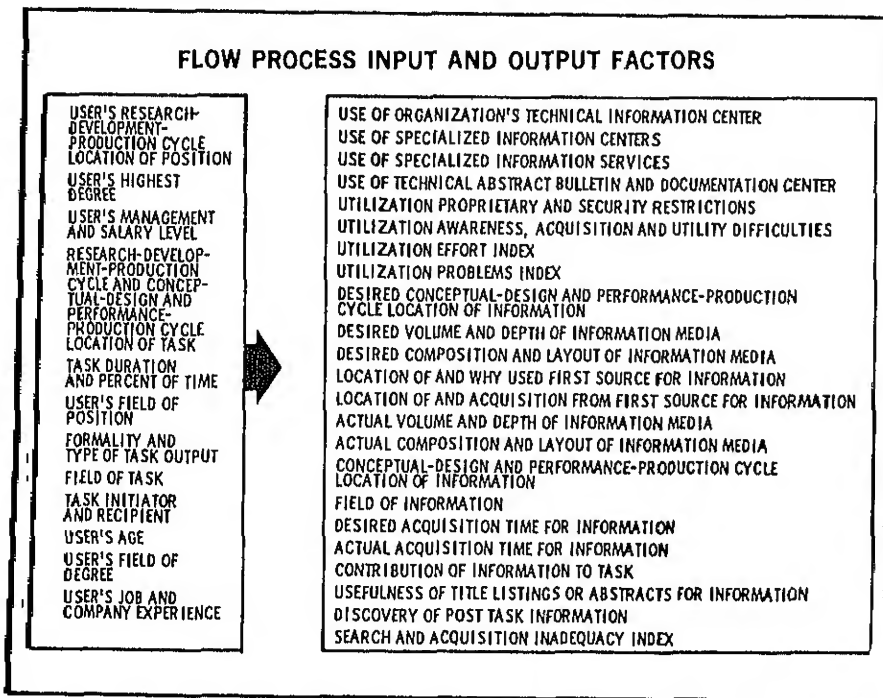


Figure 2.

Reorient the User and the Information System.

Both the user and the information system need to be reoriented. Scientists and engineers, especially those in management or those possessing advanced degrees, must become active seekers of high-quality information services. For its part, the information system must become an active provider of high-quality information services, not merely a passive document repository.

Expand the Information Base.

An information base forms the foundation of the information system. In general, it contains information which is conceptual and research-oriented. The information base has to be expanded to include design and performance information, and information which is development-and-production-oriented.

Restructure the Information Base.

The information base is composed of information media which convey the information. For the most part, these media are written in form, formal in composition, and textual in layout. It must be restructured to include media which are oral in form, informal and semi-formal in composition, and graphical in layout.

Make the Information Base Flexible.

The information base should be made flexible to permit:

- Information to be indexed, abstracted, selectively organized, and selectively analyzed.
- Information to be selectively repackaged in information media of appropriate form, composition and layout.
- Information media to be indexed and abstracted.

Make the Information Base Mobile.

The information base needs to be made mobile so that information awareness is automatic, rapid and selective; and information acquisition is quick and easy.

Expand the Information System.

Expert personnel must be employed to expand the information system by providing both information resources and connections with the informal information system ("invisible college"). This expansion will add an entirely new dimension to the information system.

Extend the Information System.

The information system has to be extended into the local work environment by the automatic and selective dissemination of abstracts for media in the information base, and listings of disciplinary areas with an expert's level of competence in each area.

The Phase II study was a pioneering attempt to draw comprehensive, definitive and unifying conclusions from data on a large portion of the flow process. From the perspective gained in this study, it is clear that certain portions of the flow process merit further investigation and that there is room for refinement and extension of the analysis. A detailed discussion of the recommendations for future analysis is contained in References 2 and 3.

The Defense Documentation Center has already taken one step toward an improved DOD information system. A development plan has been proposed which will provide automatic and selective disseminations of a bibliography containing descriptions of documents within the user organization's interest profile. Also included will be the documents in microfiche format. Other special bibliographic indexes will be available.

It is hoped that the identification of some of the requirements for technical information highlighted in these

user needs studies will provide the research and development community with the stimulus and motivation to improve this vital communication problem.

Reports cited in this article are available to authorized users from the Defense Documentation Center, Cameron Station, Alexandria, Va. 22314. Others may purchase them from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. (Prices: \$3 hard copy; \$0.65 microfiche).

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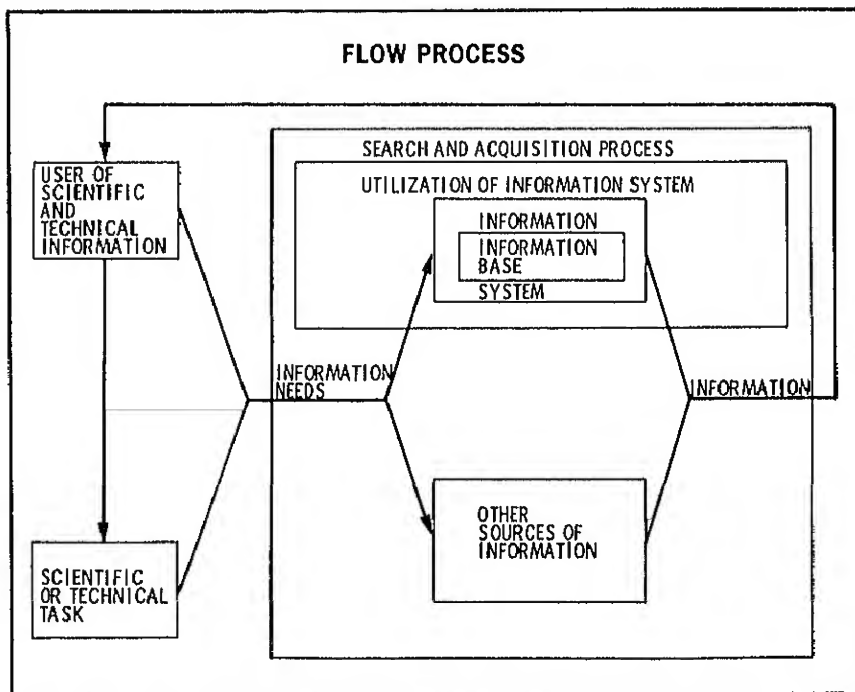


Figure 3.

Testing Techniques for System Acquisition

Captain Thomas Schwartz, USAF

The purpose of this article is to provide a brief profile of the testing techniques for system acquisition in the Air Force. The philosophy and methodology in approaching and conducting a test effort and some of the typical and significant features which have been encountered will be discussed.

The term "test" can be defined as a systematic means of collecting quantitative or qualitative information which can be analyzed and used to formulate statements within certain limits of error. This is a broad definition and, as we proceed, more specific definitions which relate directly to the kinds of tests will be made. It is fundamentally important for those engaged in testing to recognize the significance of error. Few statements are absolutely true, and limits must be presented which indicate the region where statements may be applied.

A useful rule that may be applied to tests is that they should be controlled only to the extent necessary to produce valid data for subsequent evaluation. It is necessary to avoid either compromising realism to obtain this valid data or damaging the validity of the data to achieve realism.

Policy

Tests must be designed and conducted so that test results can be analyzed. The analysis of results is the most important aspect of testing. However, evaluations can be made without current testing because of data available from other sources. Air Force Regulation 80-14, the bible for testing, lists this as the first item of Air Force policy. Other policy items are to insure that new systems are:

- Technically sound, reliable and safe for service use.

- Functionally operative, reliable, maintainable, and compatible with other systems.

- Capable of being operated and maintained by Air Force personnel and others.

System and Subsystem Test and Evaluation

System and subsystem test and evaluation are integral parts of the acquisition process. Resulting data are collected and analyzed to verify the performance characteristics, compliance with specifications, and the quantity and quality of equipment, personnel training, and logistics. The results of these tests constitute proof that the system will meet Air Force needs. Therefore, the test function



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really begins at the start of the acquisition process when specifications are being prepared. The importance of good specifications as a basic need for a meaningful test program cannot be overemphasized. Good specifications are documents which are not ambiguous, which are clear and not subject to interpretations, and which are well thought out and complete. The test function is a demonstration that the system complies with the specified requirements. Therefore, the test personnel participate in the preparation or review of the specifications to insure that the specified requirements are realistic and can be tested.

To cite an example, the Electronic Systems Division of the Air Force Systems Command is procuring the Back-Up Interceptor Control System (BUIC) to SAGE (Semi-Automatic Ground Environment System), the prime air defense system against air breathing vehicles. This system is composed, in part, of direction centers, each of which is responsible for the conduct of air defense within its assigned area of responsibility. With the advent of technological advances, SAGE survivability became extremely vulnerable. As a result, the Air Defense Command established a manual Back-Up Interceptor Control capability. This has been updated to a semi-automatic system (BUIC II) and further improved to BUIC III. The BUIC III System consists of North American Air Defense Command (NORAD) computerized control centers and the voice, teletype, and digital data communications network to connect the NORAD control centers to each other and air defense elements. Some of the performance parameters that will be measured are height, identification, tracking accuracy, tracking stability, merit stability,

time delays, weapons target separation, kill summaries, etc. These parameters are further broken down to speed, heading and position of targets, and interceptions. Total and partial system capacity with respect to these measures are evaluated.

Test Program

Formal testing is a most complex effort requiring capable management. To carry out its testing program effectively, the Air Force has divided the testing activities into three functional categories. Two of these categories are conducted during the acquisition phase and one during the operational phase. These are designated Category I, Category II and Category III testing.

To facilitate the conduct of this test program, extensive documentation is required to be submitted by the contractor for government approval. The most important document for this testing is the system test plan, providing an overall outline of the total test program.

Category I Testing

Category I testing involves extensive tests on each unit comprising the system, or each contract end item (CEI). This is accomplished in accordance with the CEI Part I specifications and is governed by the Category I test plan which is prepared by the contractor and approved by the Government. This document provides an overall outline of the complete Category I test program, including detailed test objectives, and identifies test areas and contractor responsibility. These subsystem tests are conducted in the contractor's facility by the contractor under government supervision. The recorded test results must be approved by the Government. Usually, fabrication of production units progresses parallel with the Category I test effort. Typical examples of Category I test objectives are to determine:

- Performance, reliability and integrity of individual components.
- Preliminary operational characteristics of qualitative adequacy of the component.
- Preliminary maintainability and transportability characteristics.

Following satisfactory completion of the Category I tests, a first article configuration inspection, or FACI, is

conducted by the Government on the first production machine. This establishes a baseline for configuration management. Further testing of production line machines is limited to normal quality control testing.

Category II Testing

Category II testing and evaluation covers the integration of subsystems into a complete system in as near an operational configuration as possible. Like the Category I test effort, this is accomplished in accordance with the Category II test plan which is also prepared by the contractor and approved by the Government. The Category II tests are conducted to demonstrate that the system satisfies all the requirements as defined in the system specification. These include reliability, maintainability, human engineering, safety features, etc. The level of testing conducted should permit ready identification of each parameter specified. In the case of BUIC III, some examples are number of tracks, number of radar inputs, and number of simultaneous intercepts.

The BUIC III Category II testing will be a joint contractor/Air Force effort under Air Force control at L. G. Hanscom Field during 1968. Overall management of this test effort will be by the 416M/P/418L System Program Office (SPO) through a test director. He will be assisted by a deputy for operational support appointed by the Air Defense Command and a test staff consisting of representatives from Air Force Logistics Command, MITRE Corp., System Development Corp., Burroughs Corp., and the Air Training Command. Other participating agencies are Rome Air Development Center, Ground Electronics Engineering Installation Agency, Strategic Air Command, and Federal Aviation Agency. As evidenced by the time associated with this testing and the number of agencies participating, this is a rather complex endeavor. Included in these tests will be hundreds of aircraft sorties consisting of many missions over a period of months.

Site Implementation Testing

In addition to the Category II and III testing, the BUIC System will undergo site implementation testing. The purpose of implementation testing is to insure satisfactory installation at each site of the computer

programs and communications to obtain performance measures and, based on these measures, to demonstrate to the using command that the equipment and program system segment at each site is ready for operational use. This testing will be conducted at each of the BUIC III sites to be activated into the air defense environment. Like the Category II test effort, this is a complex operation requiring the participation of many agencies and contractors. Live interceptions, as well as simulated aircraft, will be used to demonstrate the system. A site activation contractor will merge the activities required for program installation and system testing into a coordinated activity under the supervision of the SPO. At the completion of the analysis and overall test effort at each BUIC III site, the sites will be turned over to the using command incrementally.

Category III Testing

Category III testing and evaluation are performed on operational systems and controlled by the operating command. Before this testing commences, agreement on system configuration must be jointly reached by the operating command, Air Force Systems Command and Air Force Logistics Command. Category III tests are designed to fulfill objectives of all participants, including Air Training Command. Typical examples of test objectives are:

- Determine and improve operational capabilities of the system in terms of tactics, techniques, doctrine and standards.
- Determine deficiencies or limitations. Provide quantitative and qualitative data for product improvement.
- Evaluate logistic system capability.
- Determine adequacy of training, technical data and safety.

Participation of Other Agencies

Participation of other agencies and organizations—excluding contractors—is arranged at the time the System Package Program (SPP) is being prepared. This document includes a test section which designates the participating agencies, and defines their responsibilities during the test program. Coordinated approval of this document comprises a commitment on the part of these agencies, and

provides them with lead time to prepare for their role in the test program.

With respect to the conduct of the testing for Categories I, II, III and the site implementation, the various aspects of a test effort will now be discussed.

Test Design

The design of any test or experiment is based on two aspects:

- A plan for collecting observed data.
- An associated plan for the analysis in interpretation of the data and the drawing of conclusions from them.

The primary purposes for test design are to assure that the conclusions will be unbiased, and to at-

tain the required level of assurance of the validity of the results with a minimum expenditure of testing effort. Therefore, it is essential that ground rules for acceptance or rejection data be established prior to the test effort. If they are not, the project coordinator may be unduly influenced by his notion as to what the outcome of the test should be.

Collection and Processing

No matter how simple the test objectives may be, it cannot be assumed that useful data will be collected as a routine result of good test design. Test design creates the need for a detailed data control plan by designating what variables are to be measured during

each phase of the test, and to what accuracy these measurements must be made. The data collection plan, in turn, indicates how these measurements must be made to insure valid implementation of the test design. This plan should formulate the mechanisms, operational procedures, and controls for the collection of useful data.

The data-gathering process may vary from semi-automation, which is prevalent in the case of the BUIC Category II testing, to minimal automation which is primarily the case with the BUIC Category I testing. However, it is almost certain that the human can never be completely eliminated from the data collection procedures.

Furthermore, total elimination of the human would not necessarily be desirable since people have capabilities and flexibility which machines will probably never equal. These data, which have been collected from a wide variety and large number of tests, are channeled into data reduction where they are processed and put into formats suitable for test analysis.

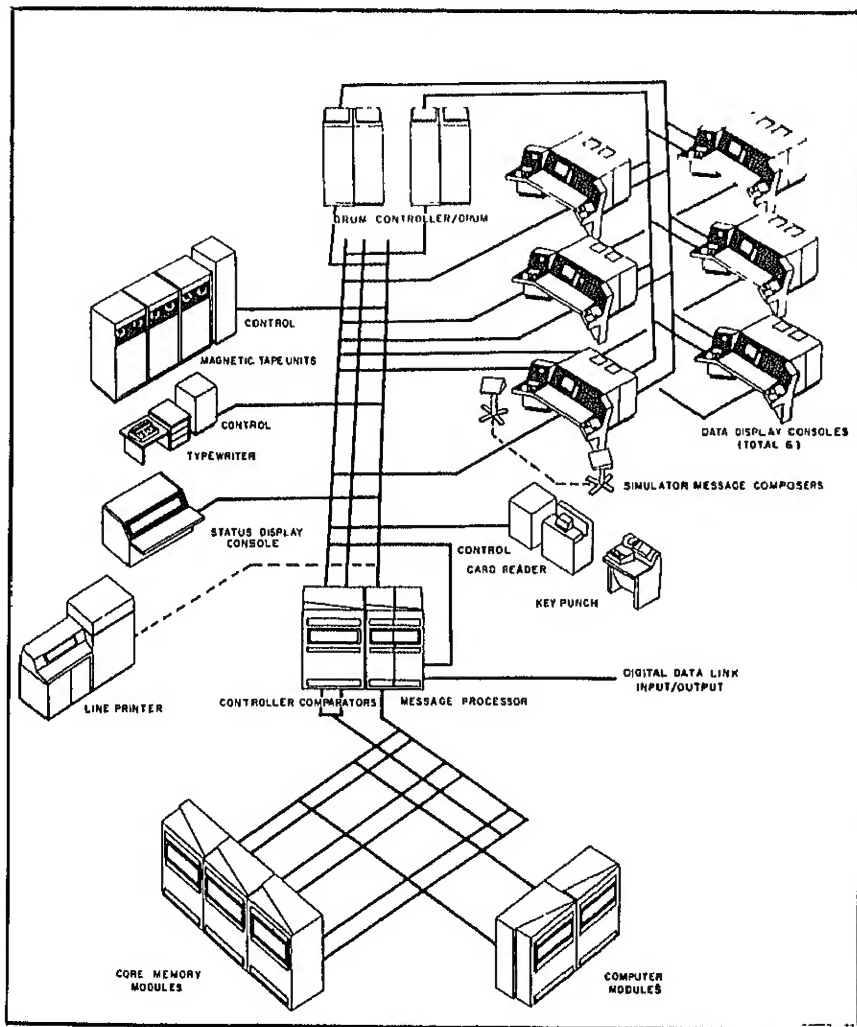
Analysis of Test Results

After a test has been conducted and the data reduced, the problem which remains is to draw conclusions and make recommendations for action. This logical process is called inference, which is the making of the translation from the test data to a conclusion concerning the "real world" situation.

In a very real sense the drawing of this conclusion will be reduced to an almost automatic action, if the test is properly designed. In the ideal situation, if all contingencies are foreseen, the rules by which inferences are to be made are firmly fixed by the test design. The steps taken in drawing a conclusion, if the test is to be objective, are:

- Determine what kind of data should be gathered and establish what answer to the question will be given for any possible outcome of the tests.
- Gather the data in the planned way.
- Give the answer to the question based on the data gathered in the test strictly according to the procedure outlined before the data was gathered. In other words, the caprices

(Continued on Page 31)



Block diagram of a Back-Up Interceptor Control Center (BUIC) which will support the SAGE air defense system in case one of its centers is destroyed. Information on aircraft is displayed on the consoles, then fed into an electronic computer which, in turn, furnishes air defense commanders with track and intercept data as well as the status of retaliatory forces.

Army Solves Water Barrier Problem

Infantry To Get "Walk in Water" Device

In an area such as the Mekong Delta of Vietnam, comprising more than 26,000 square miles of interconnecting canals, rivers, swamps, marshes and rice fields, water is a major problem for the infantryman.

To help circumvent the water barriers that hamper troop movements in certain areas of Vietnam, scientists and engineers at the Army Limited War Laboratory (LWL), Aberdeen Proving Ground, Md., have developed three new items.

The newly developed aids are: a bridge that seemingly enables soldiers to walk on water, a boat that can be breath-inflated in a few minutes, and bladders that enable a man to float across the water.

Ferretting out ways to ease the soldier's job is a prime task of the laboratory, created in 1962 as a centralized research and development activity with a quick-reaction capability for meeting requirements related to limited war.

Walking on Water

In the case of the bridge with the walk-on-water capability, an engineer in the LWL's Mobility Branch recalled the use of an experimental bridge during World War II that worked on the principle of rolling dynamic buoyancy.

Exploiting the dynamic buoyancy principle, LWL has developed a troop foot bridge that can sustain continuous column, single-file troop traffic—running, walking, or standing still. The bridge is man-portable weighing only two and one-half pounds a linear foot.

Essentially, the span is a flat self-buoyant flexible blanket that floats on the water surface until a load is placed on it. As the soldier moves over the bridge surface, the area directly stepped on presses into the water, deforming into the semblance of a shallow boat and creating water displacement buoyancy. As the soldier moves along, the depressed surface returns to its flat floating shape,

shedding any water that may have accumulated on the surface of the bridge.

The combination of the water mass inertial resistance, as the bridge is pressed into the water, and the displacement buoyancy, resulting from the depression made by the moving



load, provides the supporting dynamic force which makes the bridge feasible.

Made of ½-inch thick closed cell, polyethylene flexible foam core, bonded between 2 sheets of nylon reinforced polyethylene film, the 30-pound bridge unit is 11 feet long and 7 feet wide. Up to 10 of the bridge units can be linked to provide bridge lengths up to 110 feet.

The foam-filled blanket is provided with lateral rigidity by use of ⅞-inch diameter plastic poles that are 48 inches long and spaced 30 inches apart.

Each end of the bridge is anchored to the banks of the canal or waterway by 7 aluminum rods, ⅝ inch in diameter and 24 inches long.

Easily deployable, the bridge can be placed across streams or canals through the use of an anchor with a rope attached. The anchor is tossed across the stream and the rope is

then pulled through an eyelet in the anchor, thus pulling the bridge across the water. In instances where the stream may be too wide to effectively throw and emplace the anchor, a soldier must swim across with the rope.

Although the troop canal bridge provides an excellent capability for water crossings, it is not always practical for use by small patrols.

A Compact Breath-Inflatable Boat

With the development of the lightweight four-man boat by LWL's Environment and Survival Branch, a capability for water crossings is provided for small reconnaissance and clandestine operations.

Weighing 6 pounds, the boat can safely support 4 fully equipped soldiers or a load of 1,300 pounds. Utilizing a principle called air entrainment, the boat can be breath-inflated by two men in about five minutes.

The low silhouette craft is ideal for scouting operations or as a safety boat in river and canal crossing maneuvers. It is packaged so that it can be carried easily by one man, measuring 15x6x10 inches when deflated. Overall size of the inflated craft is 7 feet, 8 inches long and 3 feet, 6 inches wide.



The boat is fabricated of nylon material and has 10 inflatable bladders made of plastic film. The 10 bladders are placed in individual compartments around the perimeter of the boat. Since the boat is wholly a tension structure, with only the air in the bladders under compression, it is capable of carrying a full load even if three of the bladders become punctured. A false bottom in the boat provides a stabilizing ballast of water.

Two aluminum paddles are provided with the boat that may be joined to form a kayak-type paddle, which is desirable in the event only one man is paddling the boat. The standard infantryman's entrenching tool is also suitable for use as a paddle.

Floating on Water

The answer to water crossings on an even smaller scale is provided by LWL's development of flotation gear for the individual soldier.

During the monsoon season in Vietnam, soldiers encounter many flooded streams and rivers which cannot be crossed by wading. Carrying a full load of equipment, weapons and ammunition, even the best of swimmers find it almost impossible to cross these swollen waters. To solve this problem, an individual lightweight float device has been developed.

The reusable flotation device weighs only eight ounces and comes in a pouch that is carried on field-pack suspenders. The gear is enclosed

in a one-piece lightweight cover which, after inflation, forms a U shape around the body. It is worn with the open end toward the man's back.

Capable of supporting the fully equipped soldier during water crossings, the gear contains three separate compartments and bladders which are breath inflated. Using only 2 bladders, it will support a man plus 60 pounds of equipment.

The side bladders are designed to provide adequate buoyancy, with additional buoyancy provided by the front bladder. Since all bladders are interchangeable, the front bladder can also be used as a spare.

The flotation gear is also equipped with grommets on the corners, enabling several units to be tied together to form a raft. The size of the raft would be limited only by the number of flotation units available.

With the successful completion of the three new limited war items, troops in Southeast Asia will find it much easier to maneuver in swampy environments, especially during the rainy seasons of the year.

Kelly AFB Assumes Support Management for C-10A Transport

System support management of the Air Force's new C-10A transport aircraft has been assigned by the Air Force Logistics Command (AFLC) to the San Antonio Air Materiel Area (AMA), Kelly AFB, Tex.

Logistic support for the C-10A will be provided by the manufacturer, Handley Page, Ltd., of Great Britain. San Antonio AMA will monitor the logistic support contract as well as acting as the AFLC engineering agency.

The San Antonio organization will take part in acquisition engineering activities, perform operational engineering, and plan for assumption of the Air Force engineering responsibility.

The C-10A is a light transport which carries up to 18 passengers. It has twin turbo-prop engines, cruises at 300 miles an hour at altitudes up to 30,000 feet and has a range of 1,000 miles.

Digital Device Speeds Combat Communications

Navy and Marine Corps combatants will soon be able to call for air support by pressing keys on a hand-held digital message device.

Known as data transmission and switching, the system is designed to speed up the flow of messages in combat areas. It will transmit bursts of digital data over existing communications equipment to computer-selected command centers.

Transmission is simple. Pushing the "send" button releases stored information in a single burst to a receiving complex. The data is then channeled to the proper command elements. The receiving end prints a copy of the message. A message requesting air support would go directly to an air post which would vector close air support aircraft to the target.

The system requires no voice transmission and provides 60 separate classes of messages, including air support and fire support requests, logistics messages and intelligence reports.

USAF Awards Study Contract for AGM-X-3 Tactical Missile

The Air Force has awarded three study contracts for a long-range, stand-off tactical missile known as the AGM-X-3. The six-month contracts have been awarded to Hughes Aircraft Co., Martin-Marietta Corp., and The Boeing Co. Total funding for the contracts is \$650,000.

Purpose of the studies is to define the concept and establish the technical development plan for the AGM-X-3. Contractors will examine the existing research in areas of avionics and propulsion.

The AGM-X-3 is expected to operate in adverse weather and be compatible with the current and projected attack aircraft. Operational time period would be in the early or mid-1970s.

The study contracts are under the direction of the Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio.



Industrial Preparedness Against Civil Disorder

Major General Carl C. Turner, USA

[Editor's Note: Major General Carl C. Turner, USA, the Provost Marshal General, Department of the Army, has technical staff supervision over the Industrial Defense Survey Program of the Defense Department Industrial Defense Program. He is the personal representative of the Chief of Staff, U.S. Army, at the scene of major riots and civil disorders in the United States. These functions provide him firsthand knowledge of the needs of industry in preparing against the effects of civil disorders. His organization develops criteria and standards to be applied to the industrial defense survey of each facility participating in the Defense Department Industrial Defense Program.]

The Survey Program has increased the awareness of industrial management on the need for sound plant security systems and emergency preparedness planning. The purpose of the Defense Department Industrial Defense Program is to assist management of selected industries and utilities in the development of plans and procedures to safeguard against sabotage and other hostile or destructive acts. While this program does not specifically include civil disorders, an ancillary effect can be derived by proper application of plant security and emergency preparedness measures. The objective is to provide a viable production base responsive to defense production programs and military operations during an emergency.

In this article he offers his thoughts, and those of the personnel of his Industrial Defense Branch, on a practical approach to the complex problem of developing a plan designed to minimize the effects of civil disorders, sabotage, and simultaneously reduce loss resulting from theft and pilferage.]

Riot and civil disorders, or even the possibility thereof, disturb the peaceful slumber of virtually every business and municipal executive and law abiding citizen in the country today.

Acts of violence and destructive civil disorder are in clear violation of the law, but are often improperly camouflaged as "demonstrations." We must be mindful of the difference. A demonstration is the peaceful expression of a constitutional right to petition government for redress of grievances. Concern with riots and civil disorder should not lead us to confuse illegal activities with lawful demonstrations.

Responsibility for protection of property is inherent in ownership. Therefore, industry has a responsibility in the total community effort and a singular responsibility in

protecting its vested private interests. The capability of industry to lessen the impact of civil disorders on its operations depends primarily on two basic factors—proper planning and competence in performance.

Many executives of industry have not felt the full impact of the riotous conditions of last summer. For this reason they may have been lulled into a false sense of security. They may have fallen into the trap of thinking "why plan for such a thing? Surely it won't happen in our city to our property." However, incidents such as those of last summer, and those which occurred during April this year, are not restricted to the large metropolitan areas. A small incident in an urban or even a rural area can erupt into a disorder of considerable magnitude.

The difficulty of containing these

disturbances places our industrial base in a precarious position. The momentum and shifting of such incidents may well bring your plant into direct focus of the riotous group. If you have not planned for this contingency, your operations could well be disrupted and your property severely damaged.

All effective countermeasures to emergencies imply some degree of prior planning. Their effectiveness is usually proportionate to the thoroughness and soundness of the planning effort. Realistic planning concepts, if followed, will produce sound plans; but if ignored, will produce unrealistic, unworkable plans.

Pre-emergency planning is one of management's major responsibilities today. It cannot be pushed lightly to one side in the false hope or assumption that "nothing will ever happen to us."

The "hardening of the shell" of our industrial complex, by logical, realistic pre-emergency planning is a matter of dollars and "sense." The expenditures in actual dollars can easily be limited while establishing a workable program which will more than pay for itself in the long run. It is an insurance policy which can fully justify its cost in an emergency.

Although this article addresses planning for civil disorder emergencies, an effective plan would yield ancillary benefits. With minimum modification, an effective civil disorder plan could also be used during natural disaster emergencies, or large scale industrial accident emergencies, or against sabotage. Likewise, an existing plan designed to cope with these other emergencies could be modified to handle civil disorder emergencies.

Planning must start now. It is too late to start planning or to initiate effective steps to protect people, plant and equipment after the emergency occurs. It is better to be prepared than unprepared, even if nothing happens. Good planning and sound de-

fense preparedness will do much to minimize post-emergency confusion, uncertainty and fear, both in damaged and undamaged areas, and will contribute greatly to recovery from the emergency.

The effort devoted to developing a good plan can be equally as productive as safety and fire insurance. It is indeed a form of insurance. To assure the continuity of your corporate earnings, a properly developed plan may well be one of your wisest investments. The plan will yield dividends commensurate with the expenditure, realism and thoroughness which contributes to its development. The returns may be immediate or long-range, or both, but when an emergency arises necessitating implementation of the plan, the returns will be readily recognized.

In the final analysis, you must answer the question "How much am I willing to spend to protect my people, my plant, and the investment of the stockholders?" The answer will chart your course in emergency planning, and will contribute in large measure to the degree of protection you will have during a civil disorder, or other hostile or destructive acts.

Emergency planning is not an exact science. It is not a field where precise definitions can be given, or where precise solutions are offered. Planning depends upon the requirements the planner must meet and upon the many variables involved. This article introduces one approach, not necessarily the only approach to developing a sound, effective emergency plan to minimize damage which could result from civil disorders and other hostile or destructive acts. (An industrial emergency plan outline check list, pointing out essential areas to be considered, is provided at the end of this article.)

Concepts for Planning

Industrial emergency planning against the effects of civil disorders and other hostile or destructive acts should embrace the following concepts:

Realism.

The planning goal must be realistic. Any practical plan will fall short of a perfect plan. However, realism is assured if planning is oriented for the most serious eventualities, and the

plan is developed to be implemented under emergency conditions which may seriously curtail the normal conveniences, and present special problems of personnel and morale. Planning must be phased with definite planning goals and reasonable achievement dates.

Self-help.

Each facility is responsible for assuring the continuity of its operations by planning and putting into effect measures necessary to minimize damage from civil disorders or other destructive acts. Self-help implies proper utilization of existing personnel and resources to fight trouble from within. A sound emergency plan provides for maximum utilization of existing organizational structure, proven supervisory and technical skills, and material and equipment on hand. The emergency organization should not be a substitute for, but an extension of, the organization which has proven effective in routine operations. Personnel who give directions during an emergency should, insofar as is practicable, be supervisors from whom employees are accustomed to receiving directions. The skill to perform specialized emergency tasks should be derived from occupational and avocational interest.

Coordination (Mutual Aid).

The plan should be coordinated with local officials and adjacent industrial organizations. The principle of self-help is extended to the community by a coordinated planning effort to achieve mutual goals and provide for reasonable mutual aid between the facility and the community.

Dual Approach.

The dual approach concept visualizes an operational or utilitarian use, during normal periods, of emergency supplies and facilities. For example, the first aid and medical supplies, which are stored for emergency purposes, can be rotated into normal stock use.

Identification of Critical Areas.

The protection of plant and equipment in emergencies is basically a matter of compromise. As the degree of protection rises, so does the cost. The problem of what and how to protect becomes a question of weighing the importance of the plant and

equipment against the returns that can be expected from the protection provided.

Maximum effort should be expended in protecting areas that are critical to the plant operations. Short supply and long lead-time equipment should be given next priority for protection. Delicate instruments, for example, would require greater protection than large cranes. Items of machinery or equipment that have the capability of self-destruction, or of causing serious damage to other machinery or equipment, would require a high priority.

The basic unit of planning to minimize damage, and provide for rapid resumption of operations is the functional area. A functional area is composed of a group of machines or equipment performing related functions or operations. The functional areas warranting primary protection may be identified by analyzing two factors.

- The relative importance to overall production or operation.
- The relative vulnerability of machines and equipment to damage.

At the top of the scale would be a plant area which is highly important to overall production and susceptible to damage. The functional areas nearest the top of the scale should receive top priority.

A functional area criticality study might suggest the following categories:

- Group A—Those whose loss would cause an immediate stoppage of production or operation because production equipment or parts would be lost. The relative importance of the functional areas in this group is dependent upon other controlling factors: length of time to rehabilitate or procure machines, equipment, and raw materials (lead-time); length of time for tier contracting, i.e., time for subcontractor to start volume production; and length of time to develop alternate operations.

- Group B—Those whose loss would reduce production or operation because of a loss of productive equipment or parts.

- Group C—Those whose loss would not have an immediate effect on production or operation but would require additional manpower to maintain their function.

- Group D—Those whose loss would have no direct effect on production or operations.

Functional areas within each group should be ranked according to their vulnerability to damage. As the character of production or operation changes, the grouping should be revised to keep the ranking current.

Vulnerability Assessment.

Once the critical areas have been identified, the next step is to determine the degree of vulnerability to damage of each of these areas. The essence of vulnerability assessment is the type and magnitude of the emergency with which you might be faced. This could include civil disorders, sabotage, or other hostile or destructive acts. An effective plan is based on a sound estimate of the situation; i.e., a determination of the categories of emergencies and the damage-causing factors to which the facility may be exposed.

Internal vulnerability arises from the location of, and conditions within, the facility itself. For instance, the location of a plant site may make it particularly vulnerable to damage from civil disorders, and the production of a particularly critical item may make it highly vulnerable to sabotage. External vulnerability is determined by the area in which the facility is located and includes geographic location; type of surrounding terrain; types, size, and proximity of neighboring industries; size, type, and proximity of nearby military installation; or a combination of any or all of these factors. For example, a facility, which in itself does not offer a profitable target to dissident groups or a saboteur, may be vulnerable if it is part of, or adjacent to, an industrial complex, vital installation, or population center which does offer a profitable target.

Operational Readiness.

Plans alone will not guarantee protection, but sound plans, in a state of operational readiness and properly executed, will minimize the extent of damage. Operational readiness implies appropriate but controlled publicity of the program among the employees, well trained personnel, proof-tested plans, and a continuing program of testing, evaluation and revision.

Planning is a continuing process. The planning effort must be deliberate, systematic and continuous if it is to be effective. This is achieved by phased planning with definite goals

and target dates for achievement. There are three phases involved in developing an emergency plan. These are:

- Phase 1. Estimate of the situation. Based upon the results of the vulnerability assessment, reduction of vulnerability where applicable, and resources available, an estimate is made to provide data for preparation of the plan.

- Phase 2. Development of the plan. This phase is the application to specific situations, the facility's mission, and the concepts of disaster planning. It includes collecting resources, assigning and training personnel, and preparing, coordinating, and publicizing the planning documents. The extent of publicizing the plan will vary with the desires of management and the contingency against which the plan is to be applied.

- Phase 3. Testing, evaluating, and revising the plan. Upon completion of the plan, provisions must be made for testing (dry run) and actual implementation. This is the phase in which deficiencies and unrealistic features of the plan are corrected. It culminates the efforts previously made in preparation, training of personnel, and publishing the plan.



Major General Carl C. Turner, USA, is the Provost Marshal General, Department of the Army. Previously he was Provost Marshal, United States Army, Europe. He is well known in international police circles as an author and lecturer. He is a graduate of the National War College.

Developing the Plan

Effective planning requires a carefully formulated plan to mobilize plant personnel; an operational plan to direct their activities, and adequate logistical support for the duration of the disorders.

The matter of mobilizing or getting people together will be a time-consuming operation. It is one thing to assemble people and quite another to assure that they are given appropriate direction and leadership.

Prerequisite to industry's defense against the horrendous effects of a riot is close liaison with the local police department. This will keep you abreast of the social climate in your area and provide some advance warning of the imminence and possible magnitude of a disturbance. There might be a tendency to underestimate the possible danger of a sudden or slowly developing eruption. The police may not have all the information, but take what they have and use it well.

Effective command and control of your effort can best be accomplished by selecting a primary and alternate command control center. This center must be the focal point of your operations during the civil disorder. It is essential, then, that it be adequately staffed and equipped.

The most important asset of an industrial plant, during a riot or at anytime, is its employees. This is one area where communications plays an important role. A system must be developed for communicating with, or recalling, employees during non-operational periods. This, by and large, is a matter of telephonic communication. However, mass media communication such as radio and television should also be considered. It must be borne in mind that an adequate communications system is essential to plant security and continued operations. If you can't communicate, you can't operate. In addition to the notification aspect of communication, three other types must be considered. First is adequate external communications with the local police department, fire department and adjacent plants. Second is a well planned, workable internal system of communications. This system should provide instant and continuous communication within the plant. Third is an emergency back up to whatever primary system is used.

Considering that most of these riotous groups prefer to commit their crimes in the dark or by the light of burning buildings, a system of continuous perimeter and internal lighting is essential to plant protection. This requires analysis of the existing lighting to determine adequacy and continuity of illumination. In this regard, it is well to consider an emergency capability for illuminating the perimeter and critical internal areas.

The nucleus of facility defense is in-depth plant security. Every industrial plant in this country has some weakness in its security system. The achilles heel of your plant may not be known to you, but it may be known to persons who desire access to disrupt production or flow of the goods and services. A vulnerability assessment of the plant perimeter, entrances, exits and roof-top areas should reveal the weaknesses in this aspect of plant security. The regular guard force must be strengthened and trained to cope with the magnitude and peculiarities of civil disorder. Stringent procedures must be developed to assure continuous control of personnel, packages and vehicles entering and leaving the plant. Industry generally views the guard and the security force as the most non-productive segment of the operations. This thinking should be modified, because a good security force may well be the saving grace during an emergency. The necessity for good security can-

not be over-emphasized. Ask yourself this question "Do I want the police to stop protecting my home and family in order to have an adequate force to protect my plant during a civil disturbance?" If you do not assume your obligation of adequately protecting your plant, you may force such a situation to exist.

Logistical Support

This leads us to the essential step of coordination and planning for logistical support. Two basic questions need to be answered. First: From whom might I need assistance? Second: What supplies and equipment might be needed to sustain my operations and people for the expected duration of the emergency?

In the first instance help from the community leaders and local public service organizations may be needed. Such assistance may be required in the form of fire fighting resources, electric power, water supply, transportation and medical aid, to mention a few. It is essential then, that your planning effort be coordinated with them. Such coordination must be effected now—tomorrow may be too late.

The second question is answered basically in terms of in-plant inventory. This addresses such things as fire fighting equipment, items needed for emergency repairs, transportation, food, medical supplies and water. In-

tial stockpiling of these items should be started now. Arrangements should also be made to assure immediate availability of additional supplies and equipment should the need arise.

Additional pre-emergency planning measures should include:

- Review of property and liability insurance against potential loss or obligation resulting from civil disorders.
- Planning an evacuation route away from the area of the disturbance.
- Checking procedures for protecting vital corporate records, cash and other valuable items.
- Providing all essential employees with identification cards with photographs and supplying samples of these to the police.

These are just a few of the many factors to be considered in preparing a plan to prevent or minimize damage to an industrial plant during a civil disorder. After all possibilities have been considered, the plan must be put in writing and disseminated only to management personnel and key employees who must then be briefed on the plan and their individual responsibilities in achieving its objectives.

These observations are certainly not the panacea for all the problems associated with such acts of violence and lawlessness. Rather, they should be viewed as the foundation for an effective industrial defense plan.

Industrial Emergency Plan Outline

Purpose

- () Assure orderly and efficient transition from normal to emergency operations.
- () Delegate emergency authority.
- () Assign emergency responsibilities.
- () Indicate authority by company executives for actions contained in plan.

Execution Instructions

- () Appoint individual(s) to execute plan.
- () Specify conditions under which plan may be partially executed.
- () Specify conditions under which plan may be fully executed.
- () Coordinate plan among all responsible individuals to assure sequence of execution.

Command and Control Center

The command and control center is the plant command post, the focal point for directing all emergency actions. For decentralized operations, all emergency actions should be coordinated through the central control center.

- () Is location well protected?
- () Can access be controlled with minimum manpower?
- () Select alternate location.
- () Prepare management succession list of executive and administrative personnel and key employees. Designate alternates.
- () Assure that management continuity and emergency organization are in accord with state corporate laws and company charter or bylaws.
- () Pre-publish company orders constituting emergency authority.

Planning Coordination (Mutual Aid)

- () Coordinate plan with local and state officials.
- () With police departments.
- () With fire departments.
- () With adjacent plants and business firms.
- () With local utilities: power, telephone, transportation.
- () With employee union officials.
- () With local news media.

Communications

- () Adequately cover plant area.
- () Back-up primary system with two-way radios, walkie-talkies, field telephones, or megaphones (bull horns).
- () Monitor local and state police radios.
- () Monitor fire department radios.
- () Monitor hospital and ambulance radios.
- () Establish communications with adjacent plants and businesses.
- () Establish communications with management and key employees.
- () Train switchboard operators in emergency procedures.
- () Establish emergency communications procedures.

Personnel

Emergency Notification

- () Keep switchboards open and operators available.
- () Designate male operators as alternates for females who may not report.
- () Establish cascade system of notification for recall to work.
- () Prepare reporting instructions.
- () Designate reporting points, primaries and alternates out of emergency areas.
- () Inform employees of locations and procedures.
- () Instruct employees to report to points if normal routes to plant are closed.
- () Plan transportation, i.e., busses, trucks, company-owned or contracted.
- () Coordinate mutual needs with other plants.
- () Arrange police escort for emergency repair crews.
- () Pre-select routes from reporting points to plant.
- () Plan for escort of female personnel; consider car pools.

Training

- () Survey secondary skills. Match with emergency requirements.

Emergency skills required, where

() Survey of secondary emergency skills. (Relate to survey of secondary skills.)

- () Train for immediate internal or external emergency repairs.

Situation Briefings

- () Brief employees on potential for civil disorder. Police can help.
- () Brief on emergency plans. (Do this with caution. Do not create a scare program.)
- () During disorder, brief employees daily on impact of riot on plant and community. Must be factual to dispel rumor and speculation.
- () Prepare employees psychologically to remain on job; need for loyalty, self-restraint; act only as directed by management or police; report rumors to supervisors.
- () Plan post-emergency recognition of exemplary performance.
- () Explain impact of emergency on plant.

Evacuation

- () Designate routes to evacuate buildings or plants.
- () Inform employees of routes and procedures.
- () Evacuate by departments (if practical).
- () Designate primary and alternate exits away from emergency area.

Electric Power

- () Coordinate plan with local power companies: transmission lines, transformer banks, alternate distribution lines.
- () Provide emergency power for lighting and other essentials (not for full production).
- () Generators, size, location, fuel, operators.
- () Battery-powered equipment, flashlights, lanterns, radios, batteries.

Plant Security

Organizational Plans

- () Develop plant security organization.
- () Write security plans and procedures.
- () Report promptly to FBI any actual or suspected acts of sabotage or espionage.
- () Coordinate with local and state law enforcement agencies.
- () Have supervisory personnel attend plant protection training.

Guard Force

- () Organize guard force.
- () Prescribe qualification standards.
- () Train guards.
- () Uniform guards.
- () Arm guards (check with local officials the authority and legal liability during civil disturbance).
- () Deputize guards, if necessary. (Check with local officials.)
- () Assure guard force is on duty at all times.
- () Issue written orders to guard force.
- () Set up internal communications for exclusive guard force use.
- () Plan auxiliary guard force for emergency: company employees, contract guards.

Perimeter Barriers

- () Inspect security fence (or other barrier) regularly for proper maintenance.
- () Park vehicles outside of security fence or wall (to reduce fire potential and minimize hazard of concealed explosive or incendiary devices).
- () Light critical areas.
- () Install intrusion detection devices.
- () Post trespass warnings on all barriers.
- () Use screening to protect lighting fixtures against rocks and other objects.
- () Insure continuous lighting in parking lots and on ground floors.

Control of Entry

- () Develop procedures for positive identification and control of employees.
- () Give samples of identification media (photograph identification cards or badges) to local police. (Essential for crossing police lines or during curfew.)
- () Guard force controls admittance to facility.
- () Control movement and parking of vehicles.

Protecting Critical Areas

- () Identify critical areas within plant.
- () Enclose critical areas with physical barriers.
- () Designate specific personnel who may have access to critical areas.
- () Control admittance to critical areas.
- () Protect unattended critical areas by locks or intrusion detection devices. (Rotate locks upon notification of impending emergency.)
- () Develop a key control system.
- () Develop package and material control procedures.
- () Protect gasoline pumps and other dispensers of flammables. (Disconnect power source to electrically operated pumps.)

Arms Control

- () Keep arms rooms locked and under 24-hour surveillance.
- () Store ammunition in a separate locked location under 24-hour surveillance.

Personnel Security

- () Conduct pre-employment investigations of applicants.
- () Check personnel who are authorized access to critical areas.
- () Brief employees on importance of plant security and vigilance.

Fire Prevention

- () Post and enforce fire prevention regulations.
- () Post signs showing location of fire hose connections.
- () Insure that fire hose connections are compatible with local fire department equipment.
- () Extend fire alarm system to all areas of facilities.

() Determine when fire department can arrive under conditions other than civil disorder: five minutes after report of fire? ten minutes?

- () Provide secondary water supply for fire protection.
- () Install fire protection equipment on-site. Maintain properly.
- () Install mesh wire or screening material to protect roofs of buildings immediately adjacent to the perimeter from fire bombs, molotov cocktails, or other incendiary devices, if feasible. (Check with local fire department.)
- () Organize employees into fire fighting brigades and rescue squads.
- () Store combustible materials in well protected areas.
- () Instruct employees in the use of fire extinguishers.
- () Conduct fire drills periodically.
- () Maintain good housekeeping standards.
- () Implement recommendations in latest fire insurance inspection report.

Protect Vital Records

- () Classify and protect vital corporate records, cash and other valuable items.

Property and Liability Insurance

- () Review property and liability insurance against loss or obligation resulting from riots or other destructive acts.

Emergency Supplies

- () Estimate duration of emergency.
- () Pre-stock food, water and medical supplies because conditions may not permit procurement during emergency.
- () Designate separate sleeping quarters for male and female employees.
- () Provide sanitation facilities.
- () Stock administrative supplies.
- () Stock emergency repair tools, equipment and parts.
- () Develop procedures for employees to purchase gasoline for automobiles from plant supply in case local stations are closed.
- () Maintain sufficient inventory of empty 55-gallon drums to be filled with water or sand for use as barricades at entrances.
- () Have on hand enough barbed wire to form a barrier directly in front of each row of 55-gallon drums. Concertina type wire is very effective.
- () Maintain supply of panels or screen mesh to protect windows on ground floors.

Test the Plan

- () Test individual parts of the plan.
- () Test the entire plan.
- () Test without prior announcement.
- () Note weaknesses. Revise plan to include corrective actions.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Dr. Ralph R. Canter has been appointed Military Manpower Research Coordinator in the Office of the Asst. Secretary of Defense for Manpower and Reserve Affairs. He succeeds Dr. Edmund E. Dudek, who has returned to his position as Technical Dir., Naval Personnel Research Activity, San Diego, Calif.

Dr. Victor K. Heyman has been sworn in as Dep. Asst. Secretary of Defense for Southeast Asia Programs in the Office of the Asst. Secretary of Defense (Systems Analysis).

Don R. Brazier has been selected as Principal Dep. Asst. Secretary of Defense (Comptroller) succeeding Joseph S. Hoover who has retired after 38 years of government service.

Lt. Gen. John S. Hardy, USAF, has been named to succeed Lt. Gen. Leighton I. Davis, USAF, as Commandant, Industrial College of the Armed Forces, Washington, D.C. Gen. Davis will retire Aug. 1.

VAdm. Francis J. Blouin, USN, has been assigned to the Office of the Asst. Secretary of Defense (International Security Affairs) as Dir. of Military Assistance.

VAdm. Lloyd M. Mustin, USN, has been named Dir., Defense Atomic Support Agency, relieving Lt. Gen. Harold C. Donnelly, USAF, who will retire Aug. 1.

Selected for promotion to the rank of rear admiral, Capt. Kenneth C. Wallace, USN, has been reassigned as Mil. Asst. to Dep. Dir., Strategic and Space Systems, Office of Dir., Defense Research and Engineering.

Maj. Gen. John D. Lavelle, USAF, Dir., Defense Communications Planning Group, Defense Communications Agency, has been selected for promotion to lieutenant general.

Brig. Gen. Kenneth M. Gonseth, USA, has been assigned to the Defense Communications Agency, as Dep. Dir., Operations.

Brig. Gen. Richard M. Scott, USAF, has been assigned Dep. Dir. of the Defense Atomic Support Agency for

Operations and Administration, succeeding RAdm. James A. Dare, USN.

Capt. Hugh D. Byrd, (SC), USN, has been designated to command the Defense Industrial Plant Equipment Center, Memphis Tenn., succeeding Col. Fred H. Sittler, USAF, who will retire.

G. C. Gardner Jr. has assumed duties as Comptroller of the Defense Communications Agency, succeeding Thomas D. Moran Jr. who has transferred to the Department of the Army as Dep. Controller.

Col. William B. Dudley, USAF, has been named Commander, Defense Contract Administration Services Region, Detroit, Mich.

Capt. Roderick F. MacPherson, (MC), USN, has been assigned as Dir. of Medical Material, Defense Personnel Support Center, Philadelphia, Pa.

Col. Charles F. Kane, USA, has been designated Coordinator of Off-Base Housing Services, Office of the Asst. Secretary of Defense for Manpower and Reserve Affairs.

Capt. Robert A. Schaufli, (SC), USN, has been assigned as Commander, Defense Contract Administration Services Region, Chicago, Ill.

DEPARTMENT OF THE ARMY

Joseph Romm has been sworn in as Dir. of Civil Defense, Office of the Secretary of the Army.

Brig. Gen. Michael Paulick has been designated Dep. Commanding General of the Army Test and Evaluation Command, Aberdeen Proving Ground, Md. He succeeds Brig. Gen. James F. Hollingsworth.

Col. William J. Heaser Jr. has been named Chief, Missile Div., Army Combat Developments Command, Fort Belvoir, Va.

Col. Arthur T. Surkamp has assumed duties as Project Manager, Night Vision, at Fort Belvoir, Va.

Leonard R. Ambrosini is the new Chief Systems Engineer at the Army Weapons Command, Rock Island, Ill.

Col. Royal K. Tanner, Dep. Com-

manding Officer, Army Combat Development Command Communications-Electronics Agency, Fort Belvoir, Va., has been assigned additional duty as the command's representative for Project Mallard.

DEPARTMENT OF THE NAVY

Adm. John S. McCain Jr., now serving as Commander-in-Chief, U.S. Naval Forces, Europe, has been selected as Commander-in-Chief, Pacific.

Lt. Gen. James M. Masters Sr., USMC, Commanding General, Marine Corps Development and Education Command, Quantico, Va., has retired. His replacement has not yet been announced.

Maj. Gen. William J. Van Ryzin, USMC, has been nominated for promotion to lieutenant general and assignment as Chief of Staff, Marine Corps Headquarters. Present Headquarters Chief of Staff, Lt. Gen. Henry W. Buse Jr., USMC, is being reassigned as Commanding General, Fleet Marine Force, Pacific. He will replace Lt. Gen. Victor H. Krulak, USMC, who is retiring.

RAdm. James F. Calvert has been selected as the 45th Superintendent of the U.S. Naval Academy. He will relieve RAdm. Draper L. Kauffman.

RAdm. Filmore A. Gilkeson will be the new Dir., Logistics Plans Div., Office of the Chief of Naval Operations.

RAdm. H. J. Kossler will relieve RAdm. J. S. Dorsey as Commandant of the Sixth Naval District and Commander of the Charleston, S.C., Naval Base in August.

Capt. John L. Burke, has relieved Cdr. Robert H. Miller, as Commanding Officer, East Central Div., Naval Facilities Engineering Command, Philadelphia, Pa.

Capt. Richard L. Cochrane has relieved Capt. William L. Savidge, as Dep. Commander of the Surface Warfare Directorate, Hq., Naval Material Command. In another change at NAVMAT, Capt. Powell P. Vail re-

lieved Capt. James P. Jamison as Dir. of the Technical and Systems Engineering Office.

Capt. Emery G. Story Jr. is the new Officer-in-Charge, Naval Ship Engineering Center, Philadelphia, Pa., Div.

The following captain assignments have also been announced by the Bureau of Personnel:

Capt. Rupert E. Graham, Comptroller, Naval Post Graduate School, Monterey, Calif.; Capt. Bryce D. Inman, Commanding Officer and Dir., Navy Underwater Sound Lab, Fort Trumbull, New London, Conn.; Capt. Lester C. Maxwell, Force Supply Officer, Amphibious Force, Pacific; Capt. Philip S. McManus, Commander, Naval Undersea Warfare Center, Pasadena, Calif.; Capt. Elmer D. Anderson, Dir., Office of Naval Research Branch Office, Chicago, Ill.; Capt. Robert V. Hayes, Commanding Officer, Naval Air Propulsion Test Center, Trenton, N.J.; Capt. Justin A. O'Neil, Commanding Officer, Naval Avionics Facility, Indianapolis, Ind.; and Capt. Robert E. Vogel, Commanding Officer, Naval Subsistence Office, Washington, D.C.

Cdr. Gordon L. Frey is the new Public Affairs Officer at the Pacific Missile Range, Point Mugu, Calif.

DEPARTMENT OF THE AIR FORCE

Gen. William W. Momyer has been named Commander, Tactical Air Command, Langley AFB, Va. He replaces Gen. Gabriel P. Disosway who retires Aug. 1.

Gen. Maurice A. Preston, Commander-in-Chief, U.S. Air Forces, Europe, will retire Aug. 1.

Gen. John D. Ryan has been assigned as Vice Chief of Staff, USAF, relieving Gen. Bruce K. Holloway, who will become Commander-in-Chief, Strategic Air Command, Offutt AFB, Neb., Aug. 1.

Lt. Gen. William K. Martin has been named to succeed Lt. Gen. John W. Carpenter as Commander, Air University, Maxwell AFB, Fla. Gen. Carpenter will assume new duties as Dep. Chief of Staff, Personnel, USAF.

Lt. Gen. Seth J. McKee, Commander U.S. Forces, Japan, and Commander, 5th Air Force, will be reassigned to duty as Asst. Vice Chief of Staff, USAF, effective on the retirement of Lt. Gen. Hewitt T. Wheless in July.

Lt. Gen. Jack J. Catton, Dep. Chief of Staff, Programs & Resources, USAF, has been reassigned as Commander, 15th Air Force, Strategic Air Command, March AFB, Calif., effective Aug. 1. Gen. Catton will be succeeded by Maj. Gen. Lucius D. Clay Jr., who will be promoted to lieutenant general with the assignment.

Lt. Gen. Joseph R. Holzapple has been named Senior Air Force Member, Military Staff Committee, United Nations, in addition to his present duty as Dep. Chief of Staff, Research and Development, USAF.

Maj. Gen. Andrew J. Evans Jr., Dir. of Development, Office of Dep. Chief of Staff, Research & Development, USAF, will become Commander, Air Force Tactical Air Warfare Center, Eglin AFB, Fla., Aug. 1.

Brig. Gen. Robert L. Cardenas has been assigned as Commander, USAF Special Air Warfare Center, Eglin AFB, Fla.

Brig. Gen. Henry L. Hogan III is the new Dep. Dir., Office of Information, Office of Secretary of the Air Force. The assignment became effective July 1.

Col. Robert F. Long has been nominated for promotion to brigadier general and reassigned duty as Commander, Air Force Cambridge Research Laboratories, Office, Aerospace Research, L. G. Hanscom Field, Mass.

Col. Maurice R. Reilly has been selected for promotion to brigadier general and reassigned as Dep. Dir. of Civil Engineering for Construction, Office of Dep. Chief of Staff, Programs and Resources, USAF.

The following assignments have been made in the Air Force Logistics Command (AFLC):

Maj. Gen. George M. Johnson Jr., Commander, Oklahoma City Air Materiel Area, Tinker AFB, Okla.; Maj. Gen. Melvin F. McNickle, Chief of Staff, AFLC Hq., Wright-Patterson AFB, Ohio; Brig. Gen. Jowell C. Wise, Vice Commander, Ogden Air Materiel Area, Hill AFB, Utah; Col. James A. Bailey, Dep. Commander, Warner Robins Air Materiel Area, Robins AFB, Ga., with promotion to brigadier general; and Col. Robert E. Rochfort, Dir., Procurement and Production, Oklahoma City Air Materiel Area, Tinker AFB, Okla.

The following assignments have been made in the Air Force Systems Command:

Col. Lawrence T. Gordon, Asst. Dir., Range Operations, Air Force Eastern Test Range, Patrick AFB, Fla.; Col. Wayne G. Grooms, Chief, Plans Office, Electronic Systems Div.; Col. Dale E. Hansel, Dir., Civil Engineering, Air Force Eastern Test Range, Patrick AFB, Fla.; Col. William L. Marble, Dir., Materiel, Air Force Missile Development Center, Holloman AFB, N.M.; Col. Richard O. Ransbottom, Dir., Flight Test, Aeronautical Systems Div.; and Col. Richard P. Tipton, Chief, Plans and Operations Office, Aeronautical Systems Div.

Systems Effectiveness Award Names Due

The Naval Air Systems Effectiveness Advisory Board (NASEAB) reminds all naval and Navy contractor activities that the deadline for nominations of individuals for the Rear Admiral L. D. Coates Award has been set at Aug. 2, 1968.

The annual award is presented to individuals who have made significant contributions to the development and application of systems effectiveness in naval air weapons.

Nominations should include a full description of the individual's contribution and sufficient supporting data. Send nominations to: F. W. Snyder, Executive Secretary, NASEAB, Code AIR-5205A, Naval Air Systems Command, Department of the Navy, Washington, D.C. 20360.

Primary criteria for the award are:

- Design or engineering actions which enhance performance, safety, availability, reliability, or maintainability of naval air weapons.
- Maintenance or service procedures which significantly improve performance, availability, or safety, and reduce manpower requirements.
- Logistic and support procedures which significantly enhance supply, support and facilities availability.
- Other actions or procedures which materially improve the management and control processes for system effectiveness.

The award was established in honor of Rear Admiral L. D. Coates, USN, who was instrumental in the founding of NASEAB, and served as the board's first chairman.



FROM THE SPEAKERS ROSTRUM

The Employed Electron— A Source of National Power

Address by Adm. Thomas H. Moorer, USN, Chief of Naval Operations, before the Armed Forces Communications and Electronics Assn. Annual Convention, Washington, D.C., May 14, 1968.

In the defense business, in my business, where life or death can be the end-product of a communications failure, the best equipment and maximum know-how become essential. It follows, without elaboration, that the job which the communications and electronics industry is doing is vitally important to the successful conduct of our country's military operations and to the security of America itself.

This afternoon I would like to speak to you briefly about our friend the electron and the communications he makes possible. I have titled my remarks, "The Employed Electron—A Source of National Power."

It is a rather fanciful analogy, but I think of the employment of the electron by people like you and me as I think of the basic construction of the atom and the electron's relation to it. As you know, the number of electrons circulating around a nucleus is equal to the number of positive charges on the nucleus. In like fashion, the number of electrons which we employ to serve the defense uses of a ship are equal to the number of positive charges which we get from you, the nucleus of the electronic and communication industry. It is a one-to-one ratio, which I am proud to say, has today produced outstanding results.

Taking the operator's view as the Chief of Naval Operations, I would like to give you some of my impressions of how and what we're doing today in the electronic field, discuss some of our problems, and some of our future challenges.

Before tackling our current status, I should perhaps, define "communications" in the year 1968.

As a young ensign I was taught

that military communication was the "voice of command," and in that day it was perhaps no more than that. Today, communications is the ability to transmit information not just an order to "fire" or "hold your fire," "right rudder" or "left rudder." Rather, it is a total approach analogous to a "nerve system" of command. It comprises the total information impact which is the continuous sensing and reaction to the information from many systems. The flow is multidirectional. It is constant. It is dynamic. Its complexity, volume and context is at times beyond comprehension and at all times amazing.

To merely contemplate and present tactical and strategic concepts of what to communicate, to whom, and in "what mode" is today not just a technological challenge. It often has the most serious international political ramifications.

To the military officer, such as myself, the measure of success ultimately lies in the ability to manage change itself. Change constantly challenges our command and control systems in an open-ended battle of new techniques and new tools. The man who wins the battle is the man who keeps the electrons totally employed.

So much for what communications encompasses these days. Now I would like to shift to the what and how of our present operations.

Briefly, in the Navy we are currently involved with:

- Fully automated, computer controlled message centers ashore and afloat.

- Multi-channel equipment operating in both the Pacific and Atlantic Fleets.

- Seaborne communications bases—the USS Annapolis and USS Arlington—able to be deployed to any area of the world where there is a communication void or immediate need.

- Secure voice coverage—becoming a more mandatory and more common requirement daily.

- Lightweight shipboard terminals for use with satellites that have been tested and are now in limited operation. The potential is unlimited!

Thus, our computerized technological sophistication threatens total employment of the electron. With your help we are going to put every blessed one of them to work.

But we do have some problems. For example, we are just learning to become electronic extroverts—learning to improvise, to examine, learning to develop both near- and long-term solutions. We know now that we cannot look at only one system or one set of black boxes at a time. In every instance we must consider the system under examination as part of the full array of all systems which employ electrons and communicate information. This, of course, includes communications systems, weapon systems, navigation systems, electronic warfare systems, countermeasure systems, etc. It is a tactical electron offensive which must be mounted, maintained and sustained if we are to overcome any sophisticated land, sea and air opponent in the future.

You have some problems. Each time you develop a new technique, a new procedure, or a new piece of equipment, you must be able to answer such questions as:

- How can this technological breakthrough better serve the defense communicator?

- How can it be related to systems already in operation?

- How can it be adapted to future changes?

Jointly, we have some problems, too. The very nature of a global sea service with a variety of missions presents certain peculiar command and control problems. I am proud to say that our Navy systems are among the most reliable and secure found anywhere in the world. The electronic changes I've seen in almost 40 years of naval service stagger the imagination.

When I reported to my first ship, the Salt Lake City, the term "trade-offs" had not crept into our vocabulary. Logistics meant bullets, beans, and black oil—and you could almost

count the electrons in use. In fact, in the 1930s, active elements, i.e., tubes, diodes, and other electronic components, on board the Salt Lake City numbered less than 100.

By comparison, today's destroyer calls for more than 30,000 active elements, and even though our ships are getting bigger, the integration of new systems and the instrumentation needed to support these systems is rapidly outstripping the ship's growth. The physical constraints which have been imposed as a result are a familiar problem to all of us.

Another problem of interesting comparison is repair parts. In 1948, only 20 years ago, a destroyer carried approximately 8,000 spare parts valued at \$60,000. Today's missile frigate, a DLG, carries 22,000 spare parts valued at \$900,000. Similarly, I checked on radiating components on board a modern carrier. There are 60 radiating type antennas mounted on the ship at various places and perhaps as many communications circuits making joint use of several of these antennas.

What has happened is, as I said before, that instead of communications simply becoming the "voice of command," it has now become the multiplex "nerve system" of command. Whereas word used to flow from a fleet unit to the fleet commander's headquarters for evaluation and filtering, now it can and must often go many echelons higher on an immediate basis. Critical data which has been collected, evaluated and digested world-wide goes instantly to the decision makers. With faster communications, the decision makers can be further removed from the operating area and as a result are now often operating directly from our nation's capitol in times of stress.

As with all mixed blessings, this high saturation of our units with electronic hardware brings maintenance, spare parts, and reliability problems. These are daily, changing and nagging problems, but despite them we have learned to admire our technology; we embrace it and encourage it as the only way we can get on with the job. As our tools become better, so does our control. We realize that with weapons of higher and finer caliber it is imperative that our control systems be better; that our data systems be better; and that we manage these systems more efficiently than in the past.

The Man—The Primary Element

Oddly enough, with better data and better communications we have the growing problem of processing the information, and displaying it in a form which can be digested by and acted upon immediately by mere man.

Despite the fact that changing hardware is progressing on a curve almost exponential in nature, unfortunately, some disciplines must progress less rapidly. For instance, a ship must last 20 to 30 years to successfully complete an active duty career. Obviously it is impractical, if not impossible, with rising costs and our accelerating technology, to change the ships as rapidly as progress demands. As a result, we find ourselves with ships that are somewhat behind the state of the art, though they are solidly engineered and are evolving toward an improved status. This will always be an unending battle which must be recognized as the nature of a navy and of ships.

The other element, which sometimes cannot keep up with the fast pace of our technology, is the primary element of a command and control system—which is the man. Understandably, the change in the human being has not been so exponential as the changes in technology. Yet, people are still the key. They are the ingredient to which we must tailor each and every hardware system. It is the sailor who must use the sophisticated equipment, and it is the sailor who must maintain it. If for one minute we forget this basic fact, then the most sophisticated equipment can become useless to the commander in the performance of his mission.



Adm. Thomas H. Moorer, USN

Because of these slower changes in the ships of the fleet and because of the time-consuming training cycle required to properly employ new equipment, defense communications, as far as the Navy is concerned, must continue to be evolutionary rather than revolutionary. New items which we introduce into a system must not only be compatible with existing equipment, they must also be engineered to work with newer items that may be in the offing five, six, or seven years hence. This poses problems for the developers of which they are painfully aware. But, as an operator, I can guarantee you that the word "evolution" is a key word as opposed to "a complete system change over." In an existing ship, a complete system changeover produces a traumatic effect.

I am not saying that we should keep our hardware simple. This is not realistic. I realize that equipment engineered to perform a complex job within the constraints imposed by space, weight, time and other factors, must, of necessity, be complex. I do submit, however, that while hardware may, of necessity, be complex, it need not be difficult to maintain or to operate and should be adaptable to future change and upgrading.

I know that extremely long life items are in the offing; that solid state technology promises relatively maintenance-free operations in the future, but when you go back to the numbers of components and active devices on a ship, we still will have a few problems. Although it is ambitious, I think our goal must be to strive for equipment which requires no maintenance from the time it is installed until it is ready to be replaced.

When we reach this state of the art, it will mean that we can reduce and cut the long and costly training cycle for repair technicians, and solve the space problem presented by the thousands of spare parts which must presently be carried aboard ship. Presently there are over a million electronic components on the shelf in our Navy supply system. Eventually we must have more standardization and hopefully a zero electronics logistics business in which the equipment is maintenance free, and is ultimately turned in, intact, in exchange for an operable model.

One last broad and general problem which I would like to mention is the "real-time problem." I'm referring to

timeliness of delivery of new equipment to the Navy.

I am, of course, aware of the many mitigating circumstances on both the industrial and military side. The fact that either or both parties are perhaps delinquent to a degree does not reduce the severity of the problem that late delivery imposes. Too often, to the operator, it simply means he cannot get on with his job.

In some areas, such as electronic countermeasures, I can foresee where future operational requirements may demand, due to an opponent's electronic expertise, that we devise a system, design it, manufacture it, and install it in a matter of days in order to compete with the electrons of our enemies.

These are the problems we have in trying to keep the electron fully employed in the United States Navy. The challenges which they present are I think self-evident and are as great as any faced by any industry in any country.

Future Trends

Looking into the future, I sense the trend toward the evolution of a "data pipe" in and out of our ships, aircraft and shore stations. The so-called "information explosion" has already transcended our limited human capacity to absorb the different kinds of messages and data now cascading through our environment. We are rapidly approaching a state where we, as individuals, will be using the second derivative of information among themselves.

There are other trends which I believe will have a great deal of influence on the future of our military industrial team.

One is the trend toward larger contracts. I am not just talking dollars, but about the life of the contracts and the increased scope of what is bought in the way of spare parts and ancillary equipment. Another trend is that toward engineering of total systems. As a result of the total system concept, under which not only the original design and development but support ancillary items are involved, we can be confident that we will have fewer problems when we put a system into service. These are some of the things we are looking forward to in the very near future.

In the past, naval forces of varied compositions and types have either had to be deployed throughout the world, or be ready for immediate deployment. This is no less true today. The ability to maintain and support naval forces on the high seas worldwide, to command, control and coordinate them in tactical operations, to concentrate them quickly when and where they are needed requires the utmost efficiency in thought, data and information exchange.

Considering the versatility of Navy ships and their ability to perform varied roles under widely varying conditions, only one conclusion is possible. The effectiveness of American seapower is directly dependent on the total and effective employment of the electron—a source of national power.

By your presence here at this convention I am confident that you share my view that we must fully exploit the talent of the electronic and communications industry to produce new quality systems, on a reasonable cost. Your success is measured in terms of the best possible hardware for the serviceman on the front line.

His future security and our country's, in a very real sense, rests in your hands. I trust that as you keep him employed, you will also keep the U.S. electron busy in the future.

New Short-Range Sonar To Aid Submarine Rescue

A short-range sonar has been developed to enable the Navy's Deep Submergence Rescue Vehicle (DSRV) to pinpoint the escape hatch of a disabled submarine.

The problem was to accurately position a DSRV so that its transfer skirt could be lowered to envelop the topside escape hatch. A conventional television system was found to be practical only for gross positioning, and to be inadequate in muddy waters.

The short-range sonar projects two perpendicular beams, one fore and aft, and one port to starboard. Two displays in the rescue craft are used. One shows the profile of the hatch when scanned fore and aft; the other, port to starboard scan, shows the hatch and curvature of the submarine hull. Both displays also show the bottom of the transfer skirt.

Air Force Seeks New Airborne Weather Reconnaissance System

The Electronic Systems Division, Air Force Systems Command, is seeking letters from prospective contractors interested in providing specifications for an Airborne Weather and Reconnaissance System (AWARS).

Two or more firms will be awarded definition phase contracts prior to selecting a single firm to receive the acquisition contract.

The new system will provide Air Weather Service WC-130B/E and WC-135B aircraft with substantially increased capability to collect, process and relay meteorological data to ground stations.

AWARS is composed of eight meteorological subsystems, a data processing and display element, and a communications subsystem. Data to be collected includes temperature, pressure, dewpoint, wind velocity, clear air turbulence, ionospheric parameters, weather radar and selected data both above and below flight level.

The four-month definition phase contracts will be firm fixed price. Under the acquisition contract the prime contractor will be required to make, install and test one first article system aboard each type aircraft before equipping the remaining 2 weather planes.

Prospective bidders must possess experience and capability in meteorological sensor systems including weather reconnaissance radar, data processing, display and transmission systems. Bidders also must have capability in systems engineering, aircraft modification, fabrication, test reliability, maintainability, human factors and quality assurance.

Firms interested in receiving requests for proposal must submit detailed prospectus indicating the experience and capabilities. The letter of interest and prospectus should not exceed five pages, one side, and show be sent to the Electronic Systems Division, Attention: ESKP, L. G. Hanscom Field, Bedford, Mass. 01730.

Problems and Promises of Weapons Acquisition Techniques of the 1960s

Commander William J. Ryan, SC, USN

In its earliest form, a contract was nothing more than a document expressing an agreement between someone who had something to sell, and someone who had the means to buy it. The objective was to exchange the seller's product for the buyer's money—a clean-cut, equitable transaction for both parties. From this simple beginning, purchasing—at least in the defense environment—has grown into a very complicated business. Probably its most sophisticated and most complex form is a major undertaking, called weapon system acquisition. This is how the bulk of the defense dollar is spent today.

The demand for acceleration in the development of new weapon systems in the late 1960s brought to light a number of difficult problems in the design, development and production of major weapon systems. Performance objectives were being missed. Unacceptable cost growth and schedule slippages plagued major defense programs. Although these were not necessarily new problems, their scale and impact were expanded tremendously by the size and complexity of the weapon programs themselves.

There seemed to be a fundamental lack of management discipline in both industry and Government. Because the only competition between firms for development work was essentially on a technical basis, there was a temptation for contractors to "buy in" at this stage by promising highly optimistic technical performance. Large scale weapon system development was undertaken before requirements were fully defined, and before it had been clearly demonstrated that the necessary technology existed. This work was mostly of the cost-reimbursement type, and often

led to contractor inefficiencies and inequities, with the less efficient contractors being rewarded on the same basis as the highly efficient ones. Subsequent production contracts were often negotiated without competition.

The Government itself was in a situation where it could not rely completely on industry's proposals or on the contracts themselves for development work. On production work, the competitive discipline for outstanding performance was not present. The contracting organizations were still using the techniques developed years ago for buying beans and bullets. By 1961, fully 70 percent of the Navy's procurement dollars were being awarded under non-competitive conditions and one-third of this amount was tied up in cost-plus-fixed-fee contracts.

Clearly it was time for a change but what transpired during the next few years was more akin to a revolution. The inventory of responsive contracting techniques was expanded to combat specific problems:

- Incentive contracts were used extensively to shift financial risk from the Government to contractors. The percentage of defense dollars spent on cost-plus-fixed-fee contracts dropped sharply.

- Multiple incentive contracts were introduced concurrently to motivate contractors to optimize tradeoffs among performance, delivery and cost.

- The multi-year concept was introduced which allowed a buy of several years' requirements under circumstances where formerly repetitive, annual buys were made for the same equipment.

- Heavier reliance was placed on private ownership of facilities.

- Concept formulation and contract definition were developed to impart more discipline and realism into the development of requirements and specifications for new systems.

- The life-cycle costing concept was introduced to focus attention on the total cost of ownership, and force consideration of such things as maintenance and operating costs.

- The total package procurement method was developed to introduce competition at the earliest possible stage in the acquisition cycle. This allowed contracting for as much of the design, development, production and logistic support as could be defined at the outset.

Each of these techniques seemed to be more complicated than its predecessors, and required more skill and judgment in its application. In the case of all innovations, there is a trial and adjustment period which brings into sharp focus both the rewards and penalties involved. Weapon system acquisition is now reaching a point where some of the problems, as well as the benefits, of the new procurement methods and techniques can be recognized.

The first of these problems is something which is termed "disengagement."

Along with these forward steps in contracting techniques, a number of control systems in the form of schedules, reports, approvals, design reviews, etc., were established. Each of these was designed to accomplish at least one phase of an overall objective—to monitor contract performance from a technical, schedule, or cost viewpoint.

However, there are certain inherent

characteristics associated with controls. In volume, they usually create a stifling atmosphere; in their extreme, they promote a subtle shifting of responsibility from the controlled to the controller. There have been recent assertions from industry that the impact of these two undesirable by-products may be starting to outweigh the benefits expected when the controls were introduced.

There is probably some merit to these charges. If the Government wants industry to take responsibility for a product, it cannot logically insist on the authority to approve the drawings to which that product is to be built, or to direct the selection of certain suppliers for component parts, without severely diluting the contractor's authority. This approach also leads to the step-by-step approval of a product as it proceeds through development and production. A point is finally reached where the total effect of these approvals effectively relieves the contractor of all technical responsibility.

Extensive specification of design details can also make severe inroads on the contractor's discretionary design area, and effectively limit the degree of engineering expertise he can bring to bear on a given problem. Moreover, increased program costs brought on by poorly designed administrative control systems can easily override their benefits.

Wholesale abandonment by the Government of its role as steward, or the means necessary to carry out this role, is not the answer. The programs in which the Government and industry are mutually engaged are far too expensive, and the penalties for failure are much too harsh to permit such abandonment. In the final analysis, the Government, not industry, is responsible for the national defense, and the Government must have accurate and current visibility of the contractor's performance in order to react promptly if the success of a program is in jeopardy.

The ideal posture for the Government to assume is one of "hands off," but not "eyes off." Ways and means must be sought to monitor rather than control performance. The ultimate solution is not government "management," it is carefully structured contracts and control systems which encourage the contractor to manage his programs effectively.

A second problem area concerns the use of fixed-price contracts.

The Government, as the sole customer of the defense industry, is in a relatively strong position to establish the contractual framework in which the contractor will operate. Because of this "buyer's market," there has been a change in the general approach to defense contracting during the past five years. In simple terms, the Government is trying to contract under conditions which are as close to firm-fixed price as it can reasonably make them in each situation. The goal is to transfer responsibility and risk to the contractor with the expectation of a better product at lower cost. The Government would also like to see some of this cost reduction returned to the contractor in the form of increased profits, commensurate with the added risks he undertakes. Closer management attention, and more innovation in engineering and production by industry, are the means which will best achieve this objective.

One of the allegations frequently heard these days is that the Government is being a little too tough on

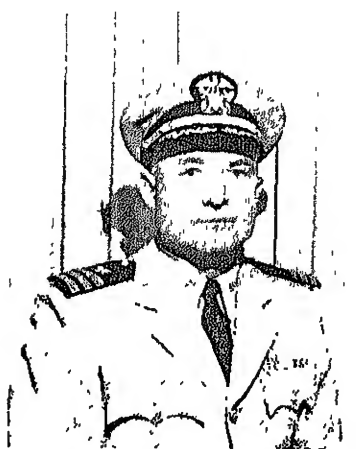
industry. In its determination to gain the benefits from increased contractor risk, there are cases where the Government may have been a bit too aggressive—instances where fixed-price contracts were used for programs which entailed significant development, and the results were generally unsatisfactory for both buyer and seller.

A number of these instances have been reviewed, and they show a general pattern which can set the stage for real trouble.

First of all, the simple substitution of fixed-price or fixed-price-incentive contract language for cost-type terms does not cause an instantaneous change in the minds of the men who design and produce the hardware. For years a large portion of the defense industry sought to achieve technological and engineering goals under the comparatively loose confines of cost-type contracts. These efforts produced hardware which may not have entirely met these goals, but which was generally acceptable.

Now, when fixed-price concepts are applied to the same type of program, the Government must force strict adherence to each and every requirement spelled out or referenced in the contract. Goals under cost-type conditions become requirements under fixed-price terms. There is relatively little room in schedules and cost estimates for technical meandering, or for exploratory problem resolution, and contractors quickly get into trouble.

The second condition which sets the stage for fixed-price difficulties is, perhaps, an outgrowth of the first. This is the fact that prospective contractors don't seem to be giving the technical requirements of defense orders the kind of hard look they deserve. If contractors are going to succeed in a fixed-price atmosphere, the impact of each contract specification must be fully analyzed in terms of its technical and economic impact on the order. Prospective troubles must be identified as elements of risk and resolved at the outset. They cannot be glossed over on the basis of a unilateral assumption about their application and enforcement. This doesn't mean that the Government expects the contractor to define contract specifications, but the Government does have the right to expect that the contractor will gain a full apprecia-



Commander William J. Ryan, SC, USN, is Director of the Planning Branch, Procurement Policy and Planning Division, Naval Material Command, Washington, D.C. He has served with the Naval Reactors Division of the Atomic Energy Commission. A 1952 graduate of the U.S. Naval Academy, he holds an MBA degree from George Washington University.

tion of the job before he takes the contract.

First production orders seem to be the most fertile area for the kinds of troubles described here. These contracts are often awarded under fixed-price terms, and there is a good deal of engineering development which remains to be completed. Also, this job consists of translating paper into weaponry. This may be the toughest task of all. Producibility, at least under industrial conditions, has not been demonstrated. Each technical conclusion reached in the development phase must be proved on the production floor where mistakes are costly.

There may be particular problems associated with first production contracts for weapons developed in government laboratories. Both Government and industry have tended to assume in the past that such contracts should be relatively trouble-free. After all, development has been "completed," and producibility has been demonstrated during the first laboratory order for working hardware.

What has sometimes not been recognized is that development, at least its final engineering stages, is usually still proceeding, and that what little production has been completed was accomplished under laboratory conditions. The hardware was fabricated by highly skilled, experienced technicians, with laboratory equipment, under ideal conditions, and with close technical supervision. There is a significant transition from these idealistic conditions to a production atmosphere. Further, this transition is often complicated by the fact that a solid technical base for government-developed hardware may not exist in industry. In these cases, the contractor has no cushion of specifically related experience on which to fall back if he gets into trouble.

There is another aspect of major weapon system acquisition which is worth mentioning. These projects are usually massive undertakings for a single firm, entailing large commitments of facilities, labor and capital over an extended period. Failure may mean a major financial setback, or even the possibility of corporate disaster. Under these conditions, the selection of contractual framework is

an extremely grave responsibility, and the Government must be careful to tailor its contracts to reflect a reasonable division of risk under each specific set of circumstances.

This should be possible now because the Government has a multitude of contractual approaches and techniques to arrive at the correct set of variables—technical performance, cost and schedule—for any task. The only remaining ingredients in the recipe for selecting the proper contractual approach are full recognition of each element of risk and balanced judgment.

The final problem is perhaps the biggest of all—the management of change in our current procurement environment.

The central feature of defense procurement demands that the Government must assume and maintain a posture of unusual flexibility. At the same time, however, it must adhere to firm contractual arrangements which are the backbone of a healthy government/industry relationship.

This divergence between the objectives of flexibility on one hand, and mutual commitment to a contractual document on the other, is so basic that there is no single, simple solution. Nevertheless, there are two things which can and must be done to alleviate the problem. First, the Government must select the type of contract with a full awareness and appreciation of the maturity of the system's design. Second, it must avoid unnecessary changes so that efforts can be concentrated on incorporating necessary improvement, regardless of the contractual arrangement.

This brief discussion of some of the government's current procurement problems does not mean that we in procurement are any less convinced that we are on the right track.

Our overall objectives are realistic and our methods are sound. In the final analysis, the current approaches to defense procurement are a distillation of the contributions of literally hundreds of experienced defense managers from both Government and industry. What is needed now is more concentration on sharpening the ability to use them selectively and correctly. In turn, a greater appreciation is needed on industry's part for the type of management attention and discipline these problems demand.

Testing Techniques

(Continued from Page 15)

of the data cannot be allowed to influence established procedures for drawing the conclusion. The ideal situation is seldom achieved and, frequently, certain factors are not found to have an apparent significant effect until the data is subjected to detailed scrutiny at the time it is being analyzed. These observations should be brought to the attention of the reader of the report to help him make his own evaluation of the conclusions, even though the observations or theories which have been formed have not been vigorously proved.

Another factor to consider in analysis is non-test data such as combat experience, analytical studies, and results of similar tests. This non-test data may provide possible explanation of unexpected significant events.

The Test Director

The final item to be covered is the special role of the test director. He must be capable of leading a group of individuals whose interests will probably be quite different. Consequently, there will be differences of opinions. The test director must be decisive for although he will have access to expert advice, he will be required to make the decisions. He must also acquire a comprehensive knowledge of the system being tested while maintaining an unbiased attitude towards the test. Once the test begins, the test director must deal only in facts. He must be consciously on guard not to influence the course of testing to achieve a desired result.

The magnitude and complexity of the test effort on today's weapon and support systems require dedicated teamwork and exceptionally competent management.

Value Engineering Guide Available

A brochure titled "Value Engineering—An Industry Guide for Contractors" has been published by the Army Aviation Materiel Command (AVCOM), St. Louis, Mo., as an aid to defense contractors.

Copies may be obtained from the Small Business Advisory Industrial Assistance Office, AVCOM, P.O. Box 209, Main Office, St. Louis, Mo. 63166, Telephone: (314) AM 8-8177, 3905 or 2688.

First Production Contract Signed for Sentinel System

The Army has signed an initial product contract with the Western Electric Co. for the buildup of a manufacturing capability, as well as production of some components to be used in the deployment of the Sentinel anti-ballistic missile system.

The initial contract for \$85,480,628 will cover the period from April 1 to Sept. 30, 1968. A longer term contract extension will be signed prior to completion of the present pact.

The contract was signed by the Contracts Office of the Sentinel System Command, Redstone Arsenal, Ala., which will administer the contract.

Sentinel is an Army-developed ballistic missile defense system which will be deployed as a defense against the potential threat of Communist Chinese intercontinental ballistic missile attack.

Total production and deployment acquisition cost of the system is expected to be about \$5 billion.

Under the contract, production will be started on electronic circuits and related items for the system's radars and computers. Many of these will be high volume components which will require a lengthy production period.

Acquisition of special tools and test equipment, required in the manufacturing process, will begin during the current contract period.

The contract also calls for the contracting firms to provide pre-production services such as design work on production facilities; mass production engineering studies; plans for training system personnel; procedures for quality control, component testing and system maintenance and development of procedures for compiling management data.

Western Electric, as the Army's prime contractor for the Sentinel production program, will produce some system hardware in its own facilities. A major function of the company, however, will be overall system management and integration of production and installation efforts by other system contractors.

Western Electric will also continue as prime contractor for the Sentinel research and development program

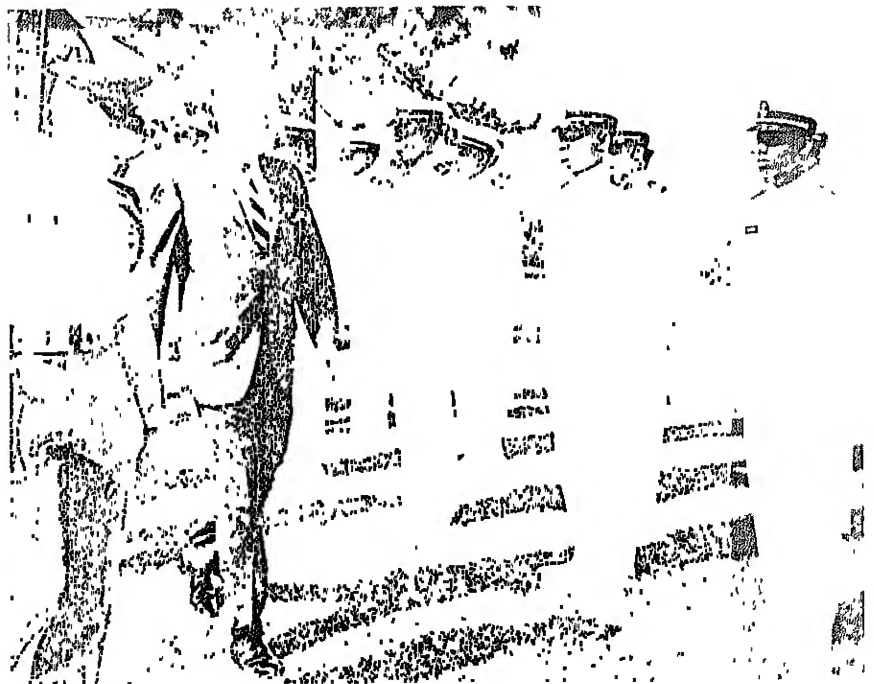
which will continue at a high priority level. Bell Telephone Laboratories directs the Sentinel technical development program for Western Electric.

The initial production contract will be shared by nine firms, including: Western Electric which will receive \$28,000,000; McDonnell-Douglas Corp., Santa Monica, Calif., developer of the Spartan missile, \$6,300,000; Martin-Marietta Corp., Orlando, Fla., developer of the Sprint missile, \$2,800,000; General Electric Co., Syracuse, N.Y., developer of the Perimeter Acquisition Radar, \$1,700,000; Raytheon Co., Wayland, Bedford, Waltham and Andover, Mass., developer of the Missile Site Radar, \$19,000,000; Lockheed Electronics Co., Los Angeles, Calif., data processing equipment, \$1,700,000; Radio Corp. of America, Harrison, N.J., \$5,000,000; Motorola Corp., Phoenix, Ariz., \$5,000,000; and Texas Instrument, Inc., Dallas, Tex., \$5,000,000, production of integrated circuit packages

DSA Introduces Automatic Data Processing in DCASRs

A new system of automatic data processing is being introduced in the Defense Contract Administration Services Regions (DCASRs) of the Defense Supply Agency for the management of defense contracts across the United States.

The computers will be used to process the data on 270,000 contracts for materials and services of the Army, Navy, Air Force, the Defense Supply Agency and the National Aeronautics and Space Administration. The data concerns contractor progress and status surveillance, quality assurance, accounting services, invoice control and timely payment, packaging requirements, transportation, and other functions essential for contract completion in accordance with specifications.



FUTURE NAVY OFFICERS. Under Secretary of the Navy Charles F. Baird inspects an honor guard of Naval Reserve Officer Training Corps cadets at Prairie View A&M College, Prairie View, Tex. Purpose of the visit was to officially establish an Navy ROTC unit at the Texas school. The new unit is the Navy's first at a predominantly Negro college.

Air Force/Industry Cost Reduction Workshop To Be Held in Los Angeles, Oct. 3, 1968

The Fourth Annual Air Force/Industry Cost Reduction Awards Ceremony and Workshop will be held at the International Hotel, Los Angeles, Calif., on Oct. 3, 1968. The purpose of this annual event is twofold: To foster better understanding, continued cooperation, and effective participation in developing improvements in the operation of the Air Force/Industry Cost Reduction Program; and to recognize outstanding contributions by members of industry.

The program planned for the 1968 workshop will include a keynote address by Hugh Witt, Deputy Assistant Secretary of the Air Force (Installations and Logistics). There will be three working panels at which ideas and problems will be discussed on the following aspects of the Air Force Cost Reduction Program: Value Engineering Change Proposals, Organization for Cost Reduction and Motivational Programs, and Stimulating Sustained Cost Reduction Activity.

A luncheon is planned and a banquet in the evening will feature the awards ceremony. The awards, which are given annually, recognize contractor employees who have submitted the most significant validated cost reduction savings suggestions during the preceding fiscal year. A maximum of 20 ideas will be selected.

Planning for the event is being conducted by a steering committee with industry and Air Force membership under the co-chairmanship of James M. Abbett, Lockheed Missiles and Space Co., 1111 Lockheed Way, Sunnyvale, Calif. 94088; and H. H. Huber, Plans and Management Group, Directorate of Procurement Policy, Headquarters, U. S. Air Force, Washington, D. C. 20330.

Other members of the 1968 Air Force/Industry Cost Reduction Steering Committee are: Robert K. Floyd, General Dynamics Corp.; Ken-

neth W. Hornor, Northrop Corp.; B. J. Kerrigan, General Electric Co.; Kenneth C. MacDonald, General Motors Corp.; James McKechnie, Martin-Marietta Corp.; Mel A. Running, The Boeing Co.; John Snider, Hughes Aircraft Co.; R. L. Strode, Avco, Corp.; Harry Tumidajewicz, Aerojet-General Corp.; W. S. Urquhart, North American Rockwell Corp.; and V. B. Von Sonn, McDonnell-Douglas Corp. Air Force members are: Colonel W. C. Robinson and Major Kaye H. Herzer, Headquarters, U. S. Air Force; Lieutenant Colonel R. K. Dewberry, Headquarters, Air Force Systems Command; Major J. S. Prowell, Headquarters, Air Force Logistics Command; and H. J. McKay, Air Force Contract Management Division.

The 1967 workshop and awards ceremony held in Boston, Mass., last fall, attended by 181 members of the Air Force-industry team, honored 26 aerospace industry employees for cost reduction efforts. Since the initial award ceremony in 1965, 66 individuals representing industry have received award certificates from the Air Force. The 26 individuals representing defense contractors, who received recognition for significant cost reduction achievements in FY 1967, are listed below:

W. H. Cartland
H. A. Faber
Lockheed Missiles and Space Co.
Savings: \$202,100

R. M. Debeyec
North American Rocketdyne Div.
Savings: \$6,000

Todd Derlachter
Sargent-Fletcher Co.
Savings: \$29,019

Emile Deveau
John C. Rolfs
General Precision, Inc.
Savings: \$5,812

H. S. Ferguson
Kenneth R. Thomas
McDonnell-Douglas Corp.
Savings: \$21,450

V. E. Fortuna
American Electric, Inc.
Savings: \$432,472

Alan J. Goehle
Atlantic Research Corp.
Savings: \$23,600

William I. Green
Hughes Aircraft Co.
Savings: \$603,385

Glenn D. Hart
Robert J. Stefing
Aerojet-General Corp.
Savings: \$3,355,800

Thomas F. Hauck
Lear-Siegler, Inc.
Savings: \$152,563

Lee Holmes
General Dynamics Corp.
Savings: \$444,900

George C. Johnson
Ashok Nagrani
Lockheed-Georgia Co.
Savings: \$513,662

Roger L. Johnson
General Motors A C Electronics
Div.
Savings: \$18,600

A. A. Macias
Martin-Marietta Corp.
Savings: \$57,477

Bob G. McCullough
United Technology Center
Savings: \$23,000

Jack B. Phelps
Thiokol Chemical Corp.
Savings: \$14,500

W. Stephen Sellars
Thomas W. Tansey
Avco Corp.
Savings: \$57,800

Carl Sollami
Sylvania Electric Products, Inc.
Savings: \$23,900

Edward K. Tyler
General Electric Co.
Savings: \$31,920

J. White
Fairchild-Hiller Corp.
Savings: \$2,191

The total DOD contractor savings increased from \$811 million in FY 1965 to \$972 million in FY 1967. Today, 85 parent companies, with 211 plants and divisions, are active in the Defense/Contractor Cost Reduction Program, (see listing in *Defense Industry Bulletin*, April 1968, page 13). All defense contractors are encouraged to participate in the program and invited to report their savings to DOD on a semi-annual basis. Information and detailed guidance for such participation are available in the Defense Contractor Cost Reduction Program Handbook (DOD 7720, 12-H).

The Air Force headquarters point of contact on matters relating to the Cost Reduction Program is: Major Kaye H. Herzer, Plans and Management Group, Directorate of Procurement Policy, Headquarters, U. S. Air Force, Room 5C 260, The Pentagon, Washington, D. C. 20330, Telephone (202) OXford 5-2766 or OXford 7-8280.

President Reports Plans, Progress in Marine Science

"Marine Science Affairs—A Year of Plans and Progress," is the title of President Lyndon B. Johnson's second annual report on Marine Science Affairs, submitted to Congress March 11.

In the report, the President emphasized two points—international cooperation in the study and use of the oceans, and strengthening the domestic program of the United States to enhance the use of the oceans, coastal waters, and the Great Lakes.

The 228-page report, which is illustrated and contains significant charts and tables, is available for purchase for \$1 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Pinnochio

The Plane With a Nose That Grows

A C-131 cargo plane, nicknamed Pinnochio because it has a nose that grows, is being developed by the Air Force as a variable stability aircraft. It will be used to test flight handling characteristics of advanced aircraft.

With a second cockpit located below and forward of the main cockpit, Pinnochio can simulate flying conditions of such advanced aircraft as the Advanced Manned Strategic Aircraft (AMSA), the Supersonic Transport (SST), and the huge C-5A cargo and passenger aircraft.

Officially called Total In-Flight Simulator (TIFS), Pinnochio is equipped with six independent controls and can be made to fly the same way as the aircraft being studied. This is done by adjusting the distance between the evaluation pilot's seat in the second cockpit and the center of gravity.

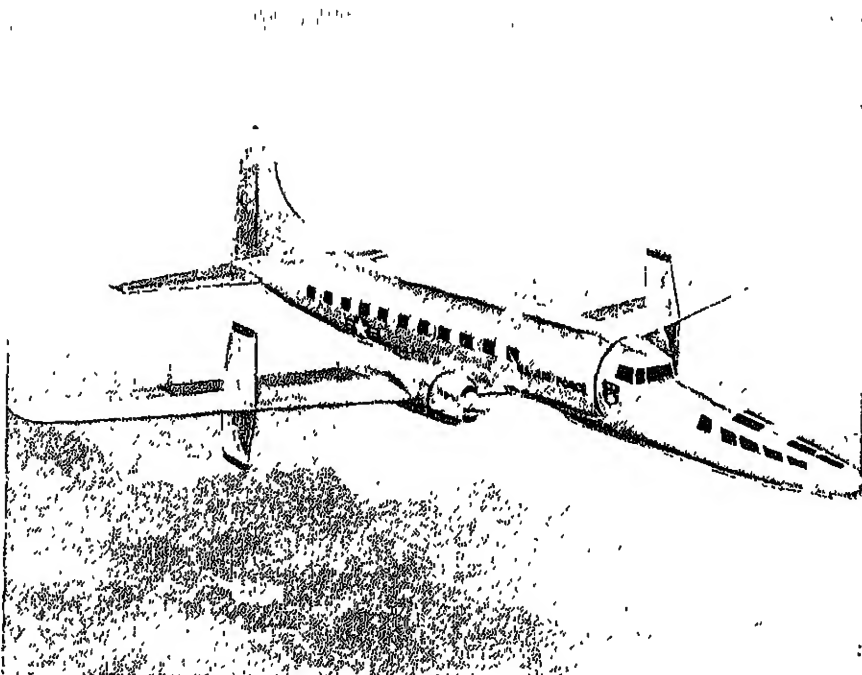
For example, to test the AMSA, a generalized cockpit with instruments would be attached to the basic nose of the C-131 aircraft. For the SST, a longer nose would be added to simulate its extended length. Each attachment would have an instrument panel and display system peculiar to the plane being simulated. With the nose of the SST installed, the TIFS extends some 20 feet beyond its regular cockpit.

The C-131 TIFS aircraft can be used to investigate flight control problems of existing aircraft, to determine requirements for new aircraft, and to train pilots to fly advanced aircraft. Emergency flight conditions can be simulated safely, since normal control of the C-131 is under command of the safety pilot at all times.

The variable stability system of the C-131 will control not only normal aerodynamic surfaces, such as ailerons, elevators and rudder, but also engine thrust for direct control of fore and aft forces; lift flaps for direct control of lift; and side force surfaces on the wings, in the form of unusual vertical fins, for direct control of lateral forces.

The simulator will carry flight evaluation pilots in the extended cockpit, safety pilots in the regular cockpit, observers in the cabin, and test engineers to operate the digital tape recording system and the analog computer.

Primary use of the TIFS would be as a flying laboratory to test various controls, instruments and aircraft configurations. Research using TIFS would enable the Air Force to save money, while determining in advance the correct design and instrumentation needed for an advanced aircraft.



SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS

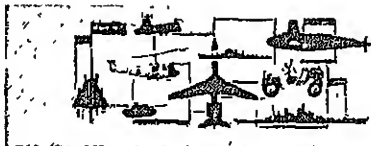
(Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	III	Oct	Nov	Dec	IV	1968 Jan	Feb	Mar	I	Apr
I. Military Prime Contract Awards																
Aircraft.....	\$ 1,945	\$ 2,989	\$ 2,696	\$ 2,262	\$ 2,102	\$ 3,049	\$ 2,513	\$ 1,249	\$ 578	\$ 805	\$ 2,632	\$ 442	\$ 530	\$ 574	1,546	\$ 834
Missile & Space Systems.....	1,040	987	1,314	861	1,230	1,166	1,580	323	429	316	1,068	348	470	393	1,211	327
Ships.....	355	491	876	239	679	407	417	153	147	110	410	109	79	236	494	79
Weapons & Ammunition.....	555	1,486	692	940	818	1,769	1,104	454	451	439	383	416	416	383	1,025	423
Electronic & Communications Equip.....	918	1,574	666	915	971	1,848	816	272	247	305	824	359	226	248	871	336
Other Hard Goods.....	843	1,842	660	1,029	915	1,564	785	252	153	248	653	245	348	306	900	314
Soft Goods.....	709	922	1,078	989	638	652	1,056	175	118	198	491	437	140	202	779	219
Construction.....	207	392	198	150	232	626	232	56	44	113	213	61	53	67	181	39
All Other.....	1,406	1,963	2,356	1,639	1,605	1,987	2,335	522	486	649	1,657	457	470	534	1,461	519
Total (Excl. Work Outside U.S.).....	7,978	12,646	10,536	9,024	9,190	13,068	10,838	3,456	2,653	3,183	9,292	2,685	2,770	2,943	8,398	\$3,090
Total Seasonally Adjusted.....	8,703	10,144	10,716	10,149	10,171	10,667	10,961	3,665	3,308	3,479	10,413	2,887	3,445	3,194	9,456	3,488
Work Outside U.S.....	521	1,195	856	672	453	834	891	193	117	145	455	288	139	134	561	157
II. Gross Obligations Incurred																
Operations.....	8,326	9,604	10,426	9,702	10,229	11,435	11,224	3,776	3,374	3,663	10,812	3,798	3,435	3,487	10,731	---
Procurement.....	4,374	8,539	5,368	5,276	5,113	8,948	6,154	2,699	1,717	1,876	6,292	1,784	1,865	2,003	5,682	---
Other.....	2,429	3,470	3,453	2,230	2,519	3,510	3,420	860	665	669	2,194	863	792	553	2,206	---
Total.....	15,129	21,613	19,247	17,208	17,861	23,893	20,798	7,335	5,755	6,208	19,298	6,445	6,092	6,043	18,579	---
III. Gross Unpaid Obligations Outstanding																
Operations.....	3,828	3,777	4,792	5,024	4,644	4,513	5,267	5,270	5,050	5,150	5,150	5,127	5,127	4,975	4,975	---
Procurement.....	18,023	22,119	22,736	23,173	22,780	25,248	24,925	25,423	24,982	24,836	24,856	24,197	24,034	24,127	24,127	---
Other.....	5,625	5,942	8,026	7,253	6,996	7,506	7,971	7,854	7,609	7,360	7,360	7,329	7,303	7,038	7,038	---
Total.....	27,476	31,838	35,554	35,450	34,420	37,267	38,163	38,547	37,641	37,366	37,366	36,653	36,454	36,140	36,140	---
IV. Net Expenditures																
Operations.....	7,689	9,076	8,968	9,087	10,002	10,731	10,001	3,641	3,456	3,397	10,494	3,550	3,273	3,416	10,299	---
Procurement.....	3,651	3,886	4,392	4,264	5,074	5,282	6,060	2,005	1,890	1,704	5,598	2,274	1,913	1,680	5,867	---
Other.....	2,757	2,647	2,484	3,092	3,160	2,001	3,047	790	847	724	2,363	1,153	1,032	1,025	3,210	---
Total.....	14,097	15,609	15,844	16,443	18,236	18,014	19,108	6,436	6,194	5,825	18,455	6,977	6,218	6,121	19,316	---
V. DOD Personal Compensation																
Military.....	3,181	3,249	3,551	3,606	3,624	3,646	3,842	1,264	1,297	1,411	3,972	1,338	1,339	1,338	4,014	---
Civilian.....	1,937	2,015	2,105	2,135	2,170	2,248	2,271	773	772	787	2,332	828	774	773	2,375	774(p)
Total.....	5,118	5,264	5,656	5,741	5,794	5,894	6,113	2,037	2,069	2,198	6,304	2,166	2,113	2,111	6,389	---
VI. Outstanding Payments																
Advance Payments.....	66	79	90	83	92	80	110	---	---	---	134	---	---	---	128	---
Progress Payments.....	4,402	4,346	4,750	5,461	5,981	6,765	7,179	---	---	---	7,491	---	---	---	7,681	---
Total.....	4,468	4,425	4,840	5,544	6,073	6,845	7,289	---	---	---	7,625	---	---	---	7,809	---
VII. Strength (Manpower)																
Military.....	2,969	3,094	3,229	3,334	3,371	3,377	3,412	3,416	3,412	3,398	3,398	3,427	3,440	3,467	3,467	---
Civilian.....	1,088	1,138	1,184	1,230	1,268	1,303	1,274	1,277	1,277	1,271	1,271	1,267	1,265	1,266	1,266	1,267(p)

P = Preliminary

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
May 28, 1968



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of May 1968:

DEFENSE SUPPLY AGENCY

- 3—Pettibone-Mulliken Corp., Washington, D.C. \$1,550,140. 100 fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400-68-C-1818 MA 300.
- West Point Pepperell, Inc., New York, N.Y. \$1,392,891. 1,495,000 linear yards of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2223.
- 4—Damascus Hosiery Mills, Damascus, Va. \$1,164,083. 1,911,640 pairs of men's socks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2236.
- Reflective Laminates, North Hollywood, Calif. \$1,106,245. 10,445 body armor plates and 7,224 body armor plates. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2230.
- 7—West Point Pepperell, Inc., New York, N.Y. \$1,200,875. 650,000 linear yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2193.
- Deering Millikin, Inc., LaGrange, Ga. \$1,062,650. 630,000 yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2192.
- Riegel Textile Corp., New York, N.Y. \$2,193,844. 1,873,000 linear yards of wind resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2225.
- 10—Gulf States Asphalt Co., Houston, Tex. \$1,239,300. 4,860,000 gallons of asphalt soil binder. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-7302.
- 13—Endicott Johnson Corp., Endicott, N.Y. \$2,729,579. 350,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2309.
- Safety First Shoe Co., Nashville, Tenn. \$2,618,113. 334,110 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2310.
- Bata Shoe Co., Belcamp, Md. \$1,715,278. 216,630 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2311.
- Addison Shoe Corp., Wynne, Ark. \$3,090,000. 400,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2308.
- 14—Aluminum Co. of America, Pittsburgh, Pa. \$12,895,007. 44,838,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-68-C-6094.
- Consolidated Bag Co., Philadelphia, Pa. \$1,727,779. 5,208,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-6095.
- Dowling Bag Co., Valdosta, Ga. \$2,208,000. 7,000,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-6097.
- Crowley Industrial Bag Co., Crowley, La. \$4,598,836. 13,950,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-6096.
- B. G. Colton & Co., New York, N.Y. \$1,911,670. 1,972,503 linear yards of wind resistant cotton and nylon sateen cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2320.
- Vitro Minerals Corp., New York, N.Y. \$1,426,364. 225,834 tons of coal. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-C-1784.
- Usbelli Coal Mine, Inc., Usbelli, Alaska. \$1,169,640. 194,940 tons of coal. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-C-1784.
- 17—B. G. Colton & Co., New York, N.Y. \$2,132,646. 1,433,645 linear yards of water repellent oxford cloth, cotton warp, nylon filling. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2320.
- 20—L. D. Lawson & Co., Long Beach, Calif. \$9,599,184. 308,160 cases of ration supplement sundries pack. Defense Personnel Support Center, Philadelphia, Pa. DSA 134-8-C-240A1.
- Kings Point Industries, Fayetteville, N.C. \$2,137,500. 150,000 body armor fragmentation protective vests with collars. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2375.
- 21—Texaco, Inc., New York, N.Y. \$1,018,855. 9,290,000 gallons of gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1974.
- Winfield Mfg. Co., Winfield, Ala. \$2,858,057. 985,583 pairs of men's cotton poplin trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2367.
- Brownwood Mfg. Co., Dallas, Tex. \$1,615,250. 500,000 pairs of men's cotton poplin trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2368.
- 22—Consolidated Bag Corp., Philadelphia, Pa. \$7,245,733. 20,000,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-6095-P001.
- 24—West Point Pepperell, Inc., New York, N.Y. \$1,850,000. 1,000,000 yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2410.
- Allen Overall Co., Monroe, N.C. \$3,365,000. 700,000 men's wind resistant cotton coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2410.
- 27—American Oil Co., Chicago, Ill. \$1,018,696. \$949,600 gallons of gasoline, 3,177,000 gallons of diesel fuel and 395,000 gallons of number 4, 5 and 6 fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1883.
- Gulf Oil, Houston, Tex. \$2,681,042. 10,366,000 gallons of gasoline, 1,855,000 gallons of diesel fuel and 395,000 gallons of number 4, 5 and 6 fuel oils. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1023.
- Riegel Textile Corp., New York, N.Y. \$3,423,010. 3,581,051 square yards of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa.
- 28—Gentex Corp., Carbondale, Pa. \$1,106,076. 16,211 combat vehicle crewmen's helmets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2421.
- Warren Pumps, Warren, Mass. \$1,030,000. Rotary and centrifugal pumps. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9550.
- 29—D'Rossi & Son Co., Vineland, N.J. \$2,650,500. 150,300 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2495.
- 31—I.B.M., Washington, D.C. \$1,081,470. \$1,081,470. Purchase of previously leased automatic data processing equipment at the Defense Construction Supply Center, Columbus, Ohio, and at the Defense Depot, Ogden, Utah. Defense Supply Agency, Alexandria, Va. DSAH00-68-F-0019.

DEPARTMENT OF THE ARMY

- 1—Ford Motors, Dearborn, Mich. \$3,801,748. 2,424 sedans, Claycomo, Mo. and Lorain, Ohio. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-2173.
- Willtaker Corp., Saugus, Calif. \$1,469,358. Igniters for 2.75-inch rocket motors. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0674.

- 2—Standard Construction Co., Columbus, Ohio. \$1,221,704. Work on the John Heil's Bankhead Lock and Dam Project. Tuscaloosa County, Ala. Engineer Dist., Mobile, Ala. DA GW01-68-C-0094.
- Chrysler Motors, Detroit, Mich. \$1,208,552. 342 trucks/truck chassis. Warren, Mich. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2235.
- Northrop Carolina, Inc., Swannanoa, N.C. \$2,214,300. CS-1 chemical agent. Edgewood Arsenal, Edgewood, Md. DA-AA15-68-C-0482.
- 3—Blount Bros., Montgomery, Ala. \$6,840,000. Construction of a 1200-foot lock on the Ohio River near Brookport, Ill. Engineer Dist., Louisville, Ky. DA CW27-68-C-0167.
- General Motors, Detroit, Mich. \$7,759,672. Metal parts for 105mm projectiles. St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0060.
- Sundt Co., Tucson, Ariz. \$5,222,206. Construction of a 50-foot extension to mobile service tower; inclosure to top of tower; enlargement of flame bucket; provide a new umbilical tower; provide propellant storage facility; and modify service building at the Western Test Range, Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA-CA09-68-C-0107.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$1,168,500. Metal parts for 105mm projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0062.
- Temco, Inc., Nashville, Tenn. \$1,380,351. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0206.
- Wythe Tool & Machine Co., Brooklyn, N.Y. \$1,365,000. Links for 7.62mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0630.
- Ghemm & Marson Construction & Engineering Co., Fairbanks, Alaska. \$6,535,050. Construction of a composite Aircraft Control and Warning Building consisting of facilities for operation, maintenance, administrative, messing and housing, recreational and other support. Cape Lisburne, Alaska. Alaska Engineer Dist. DA CA-85-68-C-0069.
- 6—General Electric, Burlington, Vt. \$1,429,631. Aircraft machine guns, pods, feeder linkers, repair parts and ancillary equipment. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0028.
- Goodyear Tire & Rubber Co., Akron, Ohio. \$1,445,094. Track shoe assemblies for light howitzers. St. Marys, Ohio. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2389.
- Armstrong Rubber Co., West Haven, Conn. \$2,210,910. 39,000 pneumatic truck tires. Hanford, Calif. and Des Moines, Iowa. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2393.
- Smith & Wesson, Springfield, Mass. \$1,020,523. 88 cal. revolvers. Army Procurement Agency, New York, N.Y. DA AG-25-68-C-1242.
- Magnavox Co., Urbana, Ill. \$3,626,241. Gun direction computers and data storage magnetic disks. Army Procurement Agency, Chicago, Ill. DA AA-5268-C-0429.
- Northrop Corp., Needham Heights, Mass. \$2,949,140. Fin assemblies for 81mm mortars. Army Procurement Agency, Chicago, Ill. DA AA00-68-C-0251.
- I.B.M., Gaithersburg, Md. \$1,997,000. Data processing system for military logistics. Army Electronics Command Procurement Office, Washington, D.C. DA AB07-67-C-0408.
- 7—Chamberlain Mfg. Co., Elmhurst, Ill. \$10,162,000. Metal parts for 175mm high explosive projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0361.
- Studebaker Corp., Minneapolis, Minn. \$2,838,830. Hertz generator sets. Mobility Equipment Command, Research & Development Center, Fort Belvoir, Va. DA AK02-67-C-0186.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract number.

- Western Electric, New York, N.Y. \$1,225,000. Overhaul of two Nike Hercules systems. Burlington, N.C. Army Missile Command, Huntsville, Ala. DA AH01-67-A-0037.
- Priester Construction Co., Davenport, Iowa \$2,108,039. Construction of a small arms test firing facility and helicopter simulator building with electrical system, parking and access road at the Rock Island Arsenal, Rock Island, Ill. Engineer Dist., Chicago, Ill. DA-CA25-68-C-0069.
- Lifton Systems, Woodland Hills, Calif. \$3,000,000. Inertial navigation sets. Electronics Command, Philadelphia, Pa. DA-AB07-68-C-0345.
- 8—Rulon Co., Chicago, Ill. \$2,369,014. Metal parts for fuzes used on artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0387.
- Barry L. Miller, Hawthorne, Calif. \$1,363,310. M13 links for 7.62mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0637.
- H. Herzberg & Son, Inc., Middletown, N.Y. \$1,203,708. Chamber cleaning brushes for M16 rifles. Rock Island Arsenal, Rock Island, Ill. DA-AF01-68-C-0746.
- 9—Western Contracting Corp., Sioux City, Iowa \$3,795,400. Navigation channel construction dredging on the Saginaw River in Michigan. Engineer Dist., Detroit, Mich. DA CW35-68-C-0006.
- General Instrument Corp., Chicopee, Mass. \$3,386,618. 750-lb. bomb components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0246.
- Raytheon Co., Lexington, Mass. \$2,822,000. Metal parts for bomb nose fuzes. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0243.
- Troup Bros., Coral Gables, Fla. \$1,053,646. Construction of 11 miles of canal and appurtenant works in connection with the Central and Southern Florida Flood Control Project, Osceola County, Fla. Engineer Dist., Jacksonville, Fla. DA-CW17-68-C-0076.
- 10—Stette, Inc., Oakland, Calif. \$3,073,500. Construction of officers quarters and officers dining hall at Mather AFB, Calif. Engineer Dist., Sacramento, Calif. DA-CA05-68-C-0077.
- Continental Motors Corp., Mobile, Ala. \$2,556,820. Remanufacture and/or retrofit of multi-fuel engine assemblies for 5-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1093.
- Allis Chalmers Mfg. Co., York, Pa. \$2,813,876. Design manufacture and delivery of hydraulic pump-turbines for the Canters Dam in Georgia. Engineer Dist., Mobile, Ala. DA-CW01-68-C-0098.
- General Motors, Detroit, Mich. \$1,977,709. Generator sets. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-6220.
- Dyson & Co., Pensacola, Fla. \$1,842,008. Construction of a three-story armament engineering evaluation facility and construction of a one-story addition to an existing holler house at Eglin AFB, Fla. Engineer Dist., Mobile, Ala. DA-CA01-68-C-0047.
- American Dredging Co., Philadelphia, Pa. \$1,452,450. Dredging in the Delaware River, Philadelphia Harbor to Londith Range, Pa. and New Jersey. Engineer Dist., Philadelphia, Pa. DA-CW61-68-C-0235.
- Norris Industries, Los Angeles, Calif. \$1,136,600. Repair of government owned cartridge case facilities. Army Procurement Agency, Pasadena, Calif. DA-04-405-AMC-00039 (A).
- Bell & Howell, Chicago, Ill. \$1,185,338. Metal parts for 81mm illuminating projectile fuzes. Evanston, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0047.
- Jones Construction Co., Seattle, Wash. \$1,011,877. Construction of a passenger terminal and cafeteria at McChord AFB, Wash. Engineer Dist., Seattle, Wash. DA-CA67-68-C-0015.
- 13—Mills Mfg. Co., Asheville, N.C. \$1,303,800. Cargo parachutes. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1889.
- Pioneer Recovery Systems, Manchester, Conn. \$1,000,110. Cargo parachutes. Columbia, Miss. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1891.
- Irving Air Chute Co., Lexington, Ky. \$1,124,470. Cargo parachutes. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1888.
- Boeing Co., Morton, Pa. \$1,548,914. Spare parts for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0006.
- General Motors, Indianapolis, Ind. \$2,875,194. T63-A-5A turbo shaft engines for OH-6A aircraft. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1333.
- Kennedy Van Saun Corp., Danville, Pa. \$1,357,500. Metal parts for high explosive projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0180.
- Caterpillar Tractor Co., Peoria, Ill. \$8,579,040. Hydraulic operated tractors. Avion, Ill. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-7503.
- D&A Equipment Co., Pensacola, Fla. \$1,252,000. Construction of an industrial treatment and disposal plant and electroplating shop. Robins AFB, Ga. Engineer Dist., Savannah, Ga. DA CA21-68-C-0061.
- Walsh & Co., Anchorage, Alaska \$1,311,272. Construction of a POL operational facility and supporting facilities, a concrete maintenance building with supporting utilities and complete fire protection system for hanger protection. Shemya AFB, Alaska. Engineer Dist., Anchorage, Alaska DA CA35-68-C-0081.
- Johnson Bros. Highway & Heavy Constructors Co. and D. H. Blattner & Son, Inc., Litchfield, Minn. \$4,763,935. Work on the Kuyw Reservoir Project. Ponca City, Okla. Engineer Dist., Tulsa, Okla. DA CW56-68-C-0204.
- Ashbach Construction Co., St. Paul, Minn. \$1,798,773. Construction and excavation work on the Buffalo Bayou and Tributaries Project. Houston, Tex. Engineer Dist., Galveston, Tex. DA CW64-68-C-0115.
- 14—Pacific Car & Foundry Co., Renton, Wash. \$1,600,000. Overhaul and conversion of Government-furnished M110 artillery guns to self-propelled full tracked M107 artillery guns. Army Procurement Agency, Oakland, Calif. DA AG05-68-C-0695.
- Stevens Mfg. Co., Ebersburg, Pa. \$1,629,247. One-and-a-half-ton cargo trailers and one-and-a-half-ton trailer chassis (M103A3). Tank Automotive Command, Warren, Mich. DA AE07-68-C-2385.
- List & Clark Construction Co., Overland Park, Kan. \$1,615,169. Construction and excavation on the local flood protection project at Oswatomie, Kan. Engineer Dist., Kansas City, Kan. DA CW41-68-C-0154.
- 15—Chamberlain Mfg. Co., Elmhurst, Ill. \$4,761,700. Modernization of support activities for the 175mm and 155mm production program. Stanton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 30-034-AMC-00163 (A).
- Ryan Aeronautical Co., San Diego, Calif. \$1,784,463. 106 line items of repair parts in support of MQM-34D Target Missile Flight Services Program. Army Missile Command, Huntsville, Ala. DA 04-405-AMC-01106 (Z).
- F.T.S. Corp., Denver, Colo. \$1,736,870. Pin and nozzle assemblies for 2.75-inch rockets. Plantingy Arsenal, Dover, N.J. DA AA21-67-C-0424.
- American Machine & Foundry Co., Brooklyn, N.Y. \$5,659,680. Metal parts for 750-lb. bombs. Garden City, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0161.
- 16—Bauer Dredging Co., Port Lavaca, Tex. \$1,259,414. Dredging work on the Mississippi River Gulf Outlet Channel Project in Orleans and St. Bernard Parishes, La. Engineer Dist., New Orleans, La. DA CW29-68-C-0177.
- Delaware Chlorine Products, Kearny, N.J. \$6,366,000. 39,000,000 lbs. of tetrachlorobenzene. Delaware City, Del. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0531.
- Bendix Corp., Teterboro, N.J. \$2,520,000. Stabilized platforms and amplifier control power supply for the Peishung missile system. Army Procurement Agency, New York, N.Y. DA AG25-68-A-0955.
- Bell Helicopter, Fort Worth, Tex. \$5,561,418. Rotary wing blades, 10,865,000 UH-1 helicopters and TH-1 trainer helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022 and DA AJ01-68-C-1911.
- 17—TRW, Inc., Camden, N.J. \$1,081,452. 104 electrical equipment shelters. Electronics Command, Philadelphia, Pa. DA AB05-68-C-1719.
- Lombke Construction Co., Inglewood, Colo. \$1,316,800. Construction of three three-story airman's dormitories at Peterson Field, Colo. Engineer Dist., Omaha, Neb. DA CA15-68-C-0057.
- Great Lakes Dredge & Dock Co., New York, N.Y. \$1,370,640. Dredging work at Little Neck Bay, N.Y. Engineer Dist., New York, N.Y. DA CW51-68-C-0034.
- Talley Industries, Mesa, Ariz. \$2,829,750. Hand grenades. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0607.
- Ford Motors, Highland Park, Mich. \$4,749,427. Utility trucks and ambulances. General Purpose Vehicle Project Agency, Warren, Mich. DA AE06-68-C-0001.
- Morgen & Oswood Construction Co., Great Falls, Mont. \$1,996,205. Construction of a junior high school at Libby, Mont. Engineer Dist., Seattle, Wash. DA CW67-68-C-0063.
- Murphy Bros., Spokane, Wash. \$1,484,195. Construction and excavation work at the Dworshak Dam and Reservoir Project, Orofino, Idaho. Engineer Dist., Walla Walla, Wash. DA CW6-68-C-0088.
- Metz Construction Co., Tucson, Ariz. \$1,359,800. Construction of three 200-man dormitories at Davis-Monthan AFB, Ariz. Engineer Dist., Los Angeles, Calif. DA-CA09-68-C-0116.
- Stetten Construction Co., Las Vegas, Nev. \$1,782,950. Construction of four 200-man dormitories at Nellis AFB, Nev. Engineer Dist., Los Angeles, Calif. DA CA09-68-C-0115.
- Union Carbide Corp., New York, N.Y. \$1,310,031. Dry batteries. Charlotte, N.C. Electronics Command, Philadelphia, Pa. DA AB05-68-C-2450.
- American Fabricated Products, Indianapolis, Ind. \$2,220,356. Pin assemblies for 81mm mortars. Army Procurement Agency, Chicago, Ill. DA AA09-68-C-0208.
- Continental Motors, Mobile, Ala. \$3,028,472. Remanufacture and/or retrofit of replenishment spares, multi-fuel assemblies for five-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-1093.
- 20—Sanford Chemical Co., Port Neches, Tex. \$2,768,000. Technical chemicals. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0532.
- Ashbach Construction Co., St. Paul, Minn. \$4,348,170. Construction work on the Dubuque, Iowa, local flood protection project. Engineer Dist., Rock Island, Ill. DA CW25-68-C-0051.
- R. M. Wells Co., Quannah, Tex. \$2,281,600. Construction of an airman's dormitory at Sheppard AFB, Tex. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0073.
- Vatronics, Patterson, N.J. \$1,796,850. Time fuzes for aircraft fares. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0195.
- Boeing Co., Morton, Pa. \$2,635,955. Transmission assemblies for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0006.
- Raytheon Co., Norwood, Mass. \$1,496,832. Multiplexers and running spare parts kits. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA 30-039-AMC-04878 (E).
- Bridge Engineering Corp., Galveston, Tex. \$1,356,460. Work on the Galveston Harbor and Channel Project. Engineer Dist., Galveston, Tex. DA CW64-68-C-0117.
- Honeywell, Inc., Boston, Mass. \$1,971,857. Infrared target indicators. Research & Development Laboratory, Mobility Equipment Command, Fort Belvoir, Va. DA AK02-68-C-0022.
- 21—Muncie Gear Works, Inc., Muncie, Ind. \$1,900,250. Pin and nozzle assemblies for 2.75-inch rockets. Plantingy Arsenal, Dover, N.J. DA AA21-68-C-0782.
- Donovan Construction Co., New Brighton, Minn. \$1,740,852. Metal parts for 155mm projectiles. Minneapolis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0044.
- United Aircraft, East Hartford, Conn. \$3,229,050. T73-0-1 engines for CH-54A helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1872.
- Servidone Construction Corp., Castleton, N.Y. \$2,931,426. Work on the Rosendale Flood Control Project. Ulster County, N.Y. Engineer Dist., New York, N.Y. DA CW51-68-C-0030.
- Magnavox Co., Fort Wayne, Ind. \$2,537,000. Radio sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0087.
- Machlett Laboratories, Stamford, Conn. \$1,244,000. Image intensifier assemblies for the night vision program. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0697.

- Whittaker Corp., Saugus, Calif. \$1,613,700. MK126 igniters for 2.75-inch rocket motors. Indio, Calif. Planting Arsenal, Dover, N.J. DA AA21-68-C-0674.
- 22--Boeing Co., Moton, Pa. \$2,249,250. Absorber assemblies, transmission shafts and rotary wing blades. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005.
- Jetta Power, Inc., Peekskill, N.Y. \$1,714,080. Gasoline engine driven generator sets. Sloatsburg, N.Y. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-7508.
- Columbus Milpar & Mfg. Co., Columbus, Ohio \$2,484,000. Fuzes for 81mm projectiles. Army Procurement Agency, New York, N.Y. DA AA09-68-C-0300.
- White Motors, Lansing, Mich. \$5,858,803. 2 1/2-ton trucks. General Purpose Vehicles Project Manager, Warren, Mich. DA AE07-68-C-5819.
- Allis Chalmers Mfg. Co., York, Pa. \$2,689,950. Design, manufacture and delivery of one Kaplan Type Turbine and one Francis Type Pump Turbine for the Clarence Cannon Dam and Reservoir Project, Salt River, Mo. Engineer Dist., St. Louis, Mo. DA CW43-68-C-0116.
- Hall Construction Co., Houston, Tex. \$1,612,206. Construction of flood protection levees and flood walls at the Texas City, Tex., Project. Engineer Dist., Galveston, Tex. DA CW64-68-C-0119.
- Penland Paper Converting Corp., Hanover, Pa. \$1,100,987 and \$1,214,082. Fiber containers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0441 and DA AA09-68-C-0442.
- Federal Container Corp., Memphis, Tenn. \$2,620,625. Fiber containers for 105mm ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0443.
- Motorola, Chicago, Ill. \$2,295,510. Metal parts for fuzes for artillery and mortar ammunition. Elk Grove Village, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0340.
- Revere Copper & Brass, Inc., Baltimore, Md. \$1,769,220. Cup cases and bullet jacket cups for 30 and 50 caliber arms. Detroit, Mich. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0538.
- 23--Seavill Mfg. Co., Waterbury, Conn. \$1,669,253. Grenade fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0161.
- Finchbaugh Products, Red Lion, Pa. \$1,112,324. Metal parts for 90mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0130.
- Brad's Machine Products, Gadsden, Ala. \$1,035,000. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0209.
- General Metal Corp., Stamford, Conn. \$2,017,839. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0054.
- Etowah Mfg. Co., Gadsden, Ala. \$1,825,125. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0205.
- HRB Slinger, Inc., Moorestown, N.J. \$3,215,500. Transmitting sets, detecting sets, maintenance fronts and surveillance information centers. Electronics Command, Philadelphia, Pa. DA AB05-68-C-1215.
- Texas Instruments, Dallas, Tex. \$4,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.
- Ghemm Co., Fairbanks, Alaska. \$1,125,000. Construction of dormitories and utilities, and replacement of primary power generators at Galena Airport, Alaska. Engineer Dist., Anchorage, Alaska. DA CA85-68-C-0086.
- International Terminal Operating Co., New York, N.Y. \$1,404,338. Services. Bayonne, N.J. Eastern Area, MTMTS, Brooklyn, N.Y. DA HC21-68-D-0102.
- King Construction Co., Texarkana, Tex. \$1,229,557. Construction work on the Kerr Lock and Dam Project, Sequoyah County, Okla. Engineer Dist., Tulsa, Okla. DA CW54-68-C-0222.
- Homan General Contractors, Lacey, Wash. \$1,021,100. Construction of eight tactical equipment shops at Fort Lewis, Wash. Engineer Dist., Seattle, Wash. DA CA67-68-C-0019.
- 24--Norris Industries, Los Angeles, Calif. \$2,300,867. 152mm projectiles. Army Procurement Agency, Pasadena, Calif. DA AG07-68-C-1267.
- Eureka Williams Co., Bloomington, Ill. \$3,666,300. 750-lb. bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0256.
- Triangle Electronics Mfg. Co. Poughkeepsie, N.Y. \$1,774,107. Special purpose cable assemblies, adapter cable assemblies, electrical connector plugs and preformed wire grips. Salinas, Calif. and Poughkeepsie, Electronics Command, Philadelphia, Pa. DA AB05-68-C-0636.
- Maremont Corp., Saco, Maine. \$1,561,016. 7.62mm machine guns with spare barrels and bipod assemblies. Army Weapons Command, Rock Island, Ill. DA AF08-67-C-0087.
- Western Electric, New York, N.Y. \$1,565,000. Overhaul of electronic shop sets for Nike Hercules Burlington, N.C. Army Missile Command, Huntsville, Ala. DA AH01-67-A-0037.
- Marquardt Corp., Ogden, Utah \$3,038,945. 2.75-inch rocket fin and nozzle assemblies. Planting Arsenal, Dover, N.J. DA AA21-67-C-0426.
- Kollman Instrument Corp., Syosset, N.Y. \$2,136,000. Night observation devices. Mobility Equipment R&D Center, Fort Belvoir, Va. DA AK02-68-C-0494.
- Bell Helicopter, Fort Worth, Tex. \$4,236,876. UH-1 aircraft transmission assemblies. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- Atlas Construction Co., Vidalia, La. \$2,957,232. Construction work on the Ouachita-Black River Navigation Project. Catahoula and La Salle Parishes, La. Engineer Dist., Vicksburg, Miss. DA CW38-68-C-0140.
- Continental Motors, Mobile, Ala. \$3,200,000. Remanufacture of replacement spares for 2 1/2-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2540.
- Raytheon Co., Bedford, Mass. \$1,198,312. Detection devices. Quincy, Mass. Planting Arsenal, Dover, N.J. DA AA21-68-C-0578.
- 27--Atlas Chemical Industries, Wilmington, Del. \$9,019,867. Operation of facility for TNT production and for support services at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00531 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$31,302,750. Operation of a facility for production of propellant, bags, liners, miscellaneous ammunition components, and for support services at the Indiana Army Ammunition Plant, Charles Town, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00097 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$22,022,846. Operation of a plant for production of various propellants and support activities at the Badger Army Ammunition Plant, Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00106 (A).
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$1,892,407. Metal parts for 42-inch illuminating projectiles. Watseka, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0036.
- Texas Instruments, Inc., Dallas, Tex. \$3,139,132. Infrared detecting sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0167.
- ITEK Corp., Lexington, Mass. \$2,505,141. Stabilized night sights. Burlington, Mass. Mobility Equipment R&D Center, Fort Belvoir, Va. DA AK02-68-C-0401.
- AVCO Corp., Stamford, Conn. \$1,724,514. T55-L-11 turbine engines for OH-47C aircraft. Aviation Materiel Command, St. Louis, Mo.
- Miller Contracting Co., Long Beach, Calif. \$1,054,050. Construction work on the Los Angeles County Drainage Area, San Gabriel River Channel Project. Irwindale, Calif. Engineer Dist., Los Angeles, Calif. DA CW09-68-C-0047.
- Construction, Ltd., Bordentown, N.J. \$1,098,873. Construction of a three-story barracks with a one-story mess hall wing at Fort Belvoir, Va. Engineer Dist., Norfolk, Va. DA CA65-68-C-0173.
- Bell Helicopter, Fort Worth, Tex. \$2,000,000. Maintenance and repair parts, and support equipment for OH-58A helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0118.
- Page Communication Engineers, Washington, D.C. \$1,453,000. Engineering services and equipment for integrated wide band communications systems in Vietnam. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0872.
- 28--Cutler-Hammer, Inc., Deer Park, N.Y. \$2,876,613. Radar sets and ancillary items. Electronics Command, Fort Monmouth, N.J. DA 28-043-AMC-02153 (E).
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$2,433,784, \$2,693,876. Metal parts for 81mm projectiles. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00803 (A).
- United Aircraft, East Hartford, Conn. \$8,468,800. Spare T37-P-1 engines. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1872.
- Dawson Bridge Co., Bloomfield, Ky. \$1,629,811. Construction work on the Cove Run Reservoir Project. Morehead, Ky. Engineer Dist., Louisville, Ky. DA CW27-68-C-0163.
- Forsberg & Gregory, Redlands, Calif. \$1,673,560. Construction of three 200-man and one 183-man almen's dormitories at Norton AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA00-68-C-0120.
- Raytheon Co., Andover, Mass. \$1,852,600. Refurbishing Hawk battery sets for the Marine Corps. Army Missile Command, Huntsville, Ala. DA AH01-68-A-0037.
- 20--Bell Aerospace Corp., Fort Worth, Tex. \$15,500,000. AH-1J helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1028.
- General Motors, Indianapolis, Ind. \$1,125,238. Rebuilding/retrofit of CD 860 transmissions for the M48 combat tank. Tank Automotive Command, Warren, Mich. DA 20-118-AMC-12016 (T).
- Sundt Construction Co., Tucson, Ariz. \$3,885,525. Construction of an operational training and evaluation facility; an operational readiness unit; engineer operation building and modifying five existing buildings. Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA09-68-C-0121.
- ITT Corp., Nutley, N.J. \$23,077,395. Radio sets and antenna alignment indicators. Clifton, N.J. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0027.
- AVCO Corp., Stamford, Conn. \$11,319,474. Gas turbine engines. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0954.
- 31--Farmers Chemical Assn., Tynes, Tenn. \$2,770,445. Production of chemicals, maintenance and support services at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00800 (A).
- Norris Industries, Los Angeles, Calif. \$16,282,843. Metal parts for 81mm projectiles and 105mm cartridge cases. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0304.
- Mason & Hanger--Silas Mason Co., New York, N.Y. \$27,809,269. Operation of the Army Ammunition Plant, Burlington, Iowa, and for loading, assembling and packing medium and large caliber ammunition and components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00085 (A).
- Holston Defense Corp., Kingsport, Tenn. \$10,797,030. Operation of the Holston Army Ammunition Plant, Kingsport, Tenn., and for manufacture of various explosives and support services. Ammunition Procurement & Supply Agency, Joliet, Ill. W-11-173-AMC-00085 (A).
- Harvey Aluminum Sales, Torrance, Calif. \$14,608,985. Loading, assembling and packing medium caliber ammunition and components; and maintenance and support services at the Army Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00520 (A).
- Honeywell, Inc., Hopkins, Minn. \$1,535,100. \$1,887,500. Metal parts for bomb fuzes and fuzes for grenades. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA00-68-C-0202 DA AA09-68-C-0255.
- Chrysler Corp., Highland Park, Mich. \$1,470,320. Metal parts for 160mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0006.
- Pace Corp., Memphis, Tenn. \$1,390,194. Surface flares. Camden, Ark. Planting Arsenal, Dover, N.J. DA AA21-68-C-0497.
- Chrysler Corp., Centerline, Mich. \$7,800,888. Engineering services for the M60 tank. DA AE07-67-C-5044.
- Hunter Outdoor Products, Long Island City, N.Y. \$1,688,063. Collapsible tank assemblies for storage of petroleum products.

Mobility Equipment Command, St. Louis, Mo DA AK01-68-C-7684.

—Lockheed Electronics, Plainfield, N.J. \$3,406,899. Shop sets with antennae, test panel, documentation and related spare subassemblies. Metuchen, N.J. Frankford Arsenal, Philadelphia, Pa DA AA25-68-C-0669.

—Sperry Rand, Phoenix, Ariz \$3,782,222. Gyro-magnetic compass sets. Army Procurement Agency, Los Angeles, Calif DA AG07-68-C-6187.

—Magnavox Co., Fort Wayne, Ind \$3,748,800. Radio sets. Electronics Command, Fort Monmouth, N.J. F-34-601-68-A-1489.

—Varo, Inc., Garland, Tex. \$1,346,700. Searchlights. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0291.

—PRD Electronics, Westbury, N.Y. \$2,233,551. Microwave sets. Army Missile Command, Huntsville, Ala. DA AH01-68-C-1992.

—Rubber Fabricators, Grantsville, W. Va. \$4,762,040. Pneumatic, 12-ton capacity pontoon floats. Grantsville, Union, and Richwood, W. Va. Mobility Equipment Command, St. Louis, Mo DA AK01-68-C-7819.

—Uni-Royal, Providence, R.I. \$4,669,577. Twelve-ton capacity pontoon floats. Mobility Equipment Command, St. Louis, Mo DA AK01-68-C-7820.

—Food Machinery Corp., Santa Clara, Calif. \$3,827,190. 4.2-inch high explosive projectiles. Army Procurement Agency, Oakland, Calif. DA AG05-68-C-0058.

—Lockwood Construction Co. and Modern Construction Co., Santa Fe, N.M. \$1,551,802. Construction of three pre-fab metal maintenance docks at Cannon AFB, N.M. Engineer Dist., Albuquerque, N.M. DA CA-47-C-0078.

—Martin Eby Construction Co., Wichita, Kan \$14,120,784. Construction of barracks at Fort Leonard Wood, Mo. Engineer Dist., Kansas City, Mo. DA CA41-68-C-0040.

—Roberts Corp., Albuquerque, N.M. \$1,007,344. Construction of a Celestial Guidance Lab including mechanical building and tunnels, and a Centrifuge Support Facility. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0068.

—Bowen-McLaughlin-York Co., York, Pa. \$4,681,643. Retrofit of M48A1 tanks to M48A3 tank configuration. Army Weapons Command, Rock Island, Ill DA AF03-67-C-0076.

—Street Construction Co., Charlotte, N.C. \$1,344,800. Construction of a 600-man airman's dormitory with support facilities at Pope AFB, N.C. Engineer Dist., Savannah, Ga.

DEPARTMENT OF THE NAVY

1—Boeing Co., Morton, Pa. \$62,812,227. CH-46D helicopter. Naval Air Systems Command. N00019-68-C-0891.

—PRD Electronics, Westbury, N.Y. \$2,358,013. Versatile-Avionics-Shop Test Equipment (VAST) systems and associated equipment. Naval Air Systems Command. N00019-67-C-0484.

—Ries Construction Co., San Diego, Calif. \$2,324,444. Construction of barracks at the Naval Amphibious Base, Coronado, San Diego, Calif Southwest Div., Naval Facilities Engineering Command, San Diego, Calif N62473-67-C-8011.

—McDonnell Douglas Corp., St. Louis, Mo. \$1,507,816. Updating of Navy and Air Force F-4 aircraft drawings to reflect present configuration. Naval Air Systems Command. N00019-67-C-0171.

—Stromberg Carlson, San Diego, Calif. \$1,435,890. Tactical display systems. Naval Air Systems Command. N00019-68-C-0253.

2—Western Electric, New York, N.Y. \$9,610,400. Classified work. Naval Electronic Systems Command. N00039 48-C-3605.

—Southern Shipbuilding Corp., Slidell, La. \$2,780,000. Construction of four large harbor tugs (YTB). Naval Ship Systems Command. N00024-68-C-0324.

—Jordan Co., Suisun City, Calif \$1,669,210. Construction of barracks at the Naval Air Station, North Island, San Diego, Calif. Naval Facilities Engineering Command. N62473-67-C-3015.

3—McDonnell Douglas Co., St. Louis, Mo. \$10,260,000. Long lead time effort for F-4J, RF-4B, F-4E and RF-4C aircraft for FY 1969; and a \$40,200,000 modification for additional funding for long lead time effort for F-4D/E and RF-4C aircraft for FY 1968. Naval Air Systems Command. N00019-67-C-0171.

—Bunker Ramo Corp., Silver Spring, Md. \$4,496,180. Work on electronic counter-measure equipment. Naval Air Systems Command. N00019-68-C-0210.

—Hoffman Electronics, El Monte, Calif \$2,596,987. Radio navigation tests sets for SH-3D, F-8 and F-9 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-4688.

—Hughes Aircraft, Culver City, Calif \$1,736,220. Incremental funding for Phoenix missile system. Naval Air Systems Command. N00019-68-C-0379.

—North American Rockwell Corp., Columbus, Ohio \$1,380,000. Design, development, fabrication, test and to furnish a naval intelligence processing system. Naval Air Systems Command. N00019-68-C-0525.

—Haiders Construction Co., Panama City, Fla. \$1,087,500. Widening of pier 314 at the U.S. Naval Shipyard, Charleston, S.C. Naval Facilities Engineering Command.

6—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$54,600,000. A-6A aircraft. Naval Air Systems Command. N00019-68-C-0106.

—Shepard Labs, Summit, N.J. \$1,972,230. Medium speed printers. Naval Electronic Systems Command. N00039-68-C-0541.

—Maxson Electronics Corp., Macon, Ga. \$1,809,376. MK 31, MOD 2 fuzes for 5"/54 ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5349.

—Treadwell Corp., New York, N.Y. \$1,771,620. Seven submarine oxygen generators and related technical data with extended engineering services. Bronx, N.Y. Naval Ship Systems Command. N00024-68-C-5212.

—Santa Barbara Research Center, Soletta, Calif. \$1,514,475. Optical assembly components for MK 91 and MK 92 fuzes used with 8- and 6-inch projectiles. Naval Ammunition Depot, Crane, Ind. N00164-68-C-0889.

7—LTV Aerospace Corp., Dallas, Tex. \$153,278,473. A-7E aircraft. Naval Air Systems Command. N0019-68-C-0076.

—Canadian Commercial Corp., Ottawa, Ontario, Canada. \$4,029,600. Torpedo tubes and ejection pumps used on submarines. Montreal, Canada. Naval Supply Center, Oakland, Calif. N00228-68-C-26-31.

—Royal Industries, Santa Ana, Calif. \$1,790,377. External auxiliary 600-gallon fuel tanks. Alhambra, Calif. Naval Air Systems Command. N00010-68-C-0090.

—North American Aviation, McGregor, Tex. \$1,460,983. Rocket motors. Naval Air Systems Command. N00019-67-C-0633.

—Northrop Corp., Newbury Park, Calif. \$1,071,960. MQM-74A target drones. Naval Air Systems Command. N00010-67-C-0456.

8—Columbus Millipar & Mfg. Co., Columbus, Ohio \$7,428,640. MK 15, MOD 1 bomb fins for use in the assembly of MK 82 bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5364.

—Automatic Sprinkler Corp., Lancaster, N.Y. \$4,410,000. Design, analysis, development, construction, test and furnishing of developmental models and 10 service test models of a swimmer lift support system. Naval Ship Systems Command. N00024-68-C-5303.

—Talley Industries, Mesa, Ariz. \$1,161,955. MAU-9A/A ejector bomb racks. Naval Air Systems Command. N00019-68-C-0490.

—Magnavox Co., Fort Wayne, Ind. \$1,350,628. Classified electronic equipment. Naval Air Systems Command. N00019-68-C-0434.

9—Honeywell, Inc., North Hopkins, Minn. \$25,760,000. Additional production of MK 46, MOD 1 torpedo main assembly and related equipment. Naval Ordnance Systems Command. N00017-68-C-1306, Mod. P002 8-0252-310.

—Del Webb Corp., Phoenix, Ariz. \$11,804,372. Construction of family housing units at Naval Air Station, Alameda, Calif., and Naval Station, Treasure Island, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBY-64800.

—Newport News Shipbuilding & Drydock Co., Newport News, Va. \$2,500,000. Work in connection with the design of a nuclear propulsion plant for an attack-type submarine. Naval Ship Systems Command. N0024-68-C-0330.

—Unified Aircraft, Stratford, Conn. \$2,375,000. Airframe parts for CH-53A helicopters. Aviation Supply Office, Philadelphia, Pa. N00383-8-8105-A-AD411-MOD 1.

—General Electric, Ulen, N.Y. \$1,222,227. Increase in the limitation of authorization for guidance and control groups for

Chaparral guided missiles. Naval Air Systems Command. N00019-68-C-0322.

10—General Precision Systems, Binghamton, N.Y. \$12,487,965. Additional units of the F-4E weapon system training set. Sunnyvale, Calif. Naval Training Device Center, Orlando, Fla. N61339-66-C-0090.

—General Motors, Indianapolis, Ind. \$2,520,982. Modification parts for T56-A7/8/10W engines for C-2A, E-2A, C-130 and P-3A aircraft. Aviation Supply Office, Philadelphia, Pa. F34601-68-C-0528-GB10.

—Consolidated Diesel Electric Co., Old Greenwich, Conn. \$1,914,044. MC-2A mobile electric power plants used to power aircraft aboard aircraft carriers. Navy Purchasing Office, Washington, D.C. N00600-68-C-1143.

—Paul J. Vagnoni, North Hills, Pa. \$1,360,000. Construction of enlisted men's barracks at the Naval Station, Philadelphia, Pa. East Central Div., Naval Facilities Engineering Command, Philadelphia, Pa.

—Dayton Aviation Radio & Equipment Corp., Troy, Ohio. \$1,169,060. Airborne VHF communication/navigation systems used on P-3C aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-3360.

13—Raytheon Co., Bedford, Mass. \$5,207,023. Design and development on Sparrow III missiles. Naval Air Systems Command. N00019-67-C-0010.

—General Electric, Schenectady, N.Y. \$1,500,000. Nuclear propulsion R&D. Naval Ship Systems Command. N00024-67-C-5016.

—American Machine & Foundry Co., York, Pa. \$1,132,193. MK II, MOD O and MK II, MOD I, 81mm mortars and 60-cal. machine gun cradle adjuster kits. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3383.

14—IBM Corp., Oswego, N.Y. \$3,724,027. Design, development and fabrication of an airborne anti-submarine warfare computer and support equipment for use in project A-NEW (ASW Integrated Avionics System). Naval Air Development Center, Johnstown, Pa. N62260-68-C-0870.

—Hughes Aircraft, Fullerton, Calif. \$1,741,066. Naval Tactical Data System display equipment, repair parts and technical data. Naval Ship Systems Command. N00024-68-C-1244.

—Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$1,600,000. Work and services on the nuclear powered ballistic missile submarine USS Woodrow Wilson (SSBN-624). Naval Ship Systems Command. N00024-68-C-0338.

15—Newport News Shipbuilding & Drydock Co., Newport News, Va. \$106,800,000. Design and construction of the nuclear powered attack aircraft carrier USS Nimitz (CVAN-68). Naval Ship Systems Command. N00024-67-C-0325.

—General Dynamics, Pomona, Calif. \$13,885,000. Additional funding for the Standard Arm missile system. Naval Air Systems Command. N00019-68-C-0074.

—Dillingham Corp., Honolulu, Hawaii. \$7,487,245. Modernization of five ocean minesweepers. Naval Ship Systems Command. N655202-68-C-0901 J.O. 0019.

—Magnavox Co., Fort Wayne, Ind. \$2,453,831. Spare parts for AN/APQ-124 doppler and ranging radar system for F-8J aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-6801-0076.

—Jordan Co., Suisun City, Calif. \$2,243,949. Construction of two 600-man barracks buildings at the Naval Schools Command, San Francisco Bay Naval Shipyard, Vallejo, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBY-85464.

—Cameron Iron Works, Houston, Tex. \$2,255,538. MK 12 guided missile boosters for the Torrier missile system. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0576.

16—G. L. Cory, Inc., San Diego, Calif. \$2,412,346. Construction of an aircraft maintenance hanger at the Naval Air Station, Miramar, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3018.

—American Mfg. Co. of Tex., Fort Worth, Tex. \$1,924,002. MK 24 warheads used with 5-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5303.

—General Precision Systems, Glendale, Calif. \$1,914,000. Production of modification

- kits for MK 48 torpedo fire control systems. Naval Ordnance Systems Command N00017-68-C-1218.
- 17-Raymond Engineering, Middletown, Conn. \$5,910,900 MK 316, MOD 9, bomb fuzes Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5368
 - Sperry Rand Corp., Charlottesville, Va. \$1,127,202. Plotting systems, repair parts, related engineering services and associated technical data Naval Ship Systems Command N00024-68-C-5218.
 - 20-North American Rockwell Corp., Columbus, Ohio \$3,000,000 T-213 aircraft. Naval Air Systems Command. NOW (A) 66-0081.
 - Polaron Products, New Rochelle, N.Y. \$4,662,606 MK 82, MOD 1, conical fin assemblies for 500-lb. bombs. Batesville, Miss Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5381.
 - General Dynamics, Pomona, Calif. \$1,653,700. Research and development on the Standard Aim missile. Naval Air Systems Command. N00019-68-C-0400.
 - Magnavox Co., Fort Wayne, Ind. \$1,281,734 Airborne detecting transmitting sets and ancillary items Naval Air Systems Command N00019-67-C-0678.
 - 21-General Electric, Schenectady, N.Y. \$20,000,000. Design and to furnish nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5321 Mod. 7
 - Bendix Corp., Baltimore, Md. \$3,411,028. Airborne receiver transmitters and associated equipment. Naval Air Systems Command NOW 66-0637.
 - Kilgore Corp., Toona, Tenn. \$2,415,600. MK 24, MOD 4, parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5380.
 - Concrete Pavers, Tampa, Fla. \$1,725,500. Construction of an aircraft parking apron at the Marine Corps Air Facility, Jacksonville, N.C. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. NBy-88296
 - 22-United Aircraft, Hartford, Conn. \$7,213,101. Increased funding for F52-P-8A engines. Naval Air Systems Command. N00019-67-C-0182.
 - Sperry Rand, St. Paul, Minn. \$4,400,000. Avionics computers. Naval Air Systems Command N00019-68-C-0255.
 - Collins Radio Co., Richardson, Tex. \$3,334,119. Airborne VLF communications systems and related equipment Naval Air Systems Command. N00019-67-C-0382.
 - Westinghouse Electric, Baltimore, Md. \$2,187,500 Radar sets for F-4D aircraft Naval Air Systems Command. N00019-67-C-0462.
 - Planning Research Corp., Los Angeles, Calif. \$1,343,683. Programming and program analysis in support of the message processing and distribution systems for CVA(N) 68, San Diego, Calif. Navy Purchasing Office, Los Angeles, Calif.
 - Fred A. Arnold, Inc., Los Angeles, Calif. \$1,701,339. Construction of 100 housing units at the Naval Air Station, Lemoore, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBy-01701
 - Ingersoll Products, Chicago, Ill. \$6,044,714 MK 81, MOD 1, bomb bodies for 250-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3418.
 - 23-Goodyear Aerospace Corp., Akron, Ohio. \$15,879,761. Subroc missiles. Naval Ordnance Systems Command. N00017-68-C-1408
 - Arntz Bros., San Rafael, Calif. \$1,248,700. Construction of a maintenance dock for large aircraft at Travis AFB, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif.
 - 24-LTV Aerospace Corp., Dallas, Tex. \$5,065,527. Increased funding to extend the service life of RF-8A aircraft. Naval Air Systems Command. N00019-67-C-0146.
 - General Dynamics, Pomona, Calif. \$3,425,227. Standard Arm missile research and development. Naval Air Systems Command. N00019-67-C-0070.
 - Magnavox Research Labs, Fort Wayne, Ind. \$1,781,000. Production of equipment for a classified communications system. Torrance, Calif. Naval Electronic Systems Command. N00039-68-C-1567.
 - McDonnell Douglas Corp., Long Beach, Calif. \$1,530,000. Long lead time effort and materials to support FY 1969 procurement of TA-4F aircraft. Naval Air Systems Command. N00019-67-C-0170.
 - 27-General Electric, Utica, N.Y. \$5,800,000.

- Airborne data processing systems. Naval Air Systems Command N00019-68-C-0254.
- Sandstrand Corp., Rockford, Ill. \$1,983,160 Constant speed drives and frequency control boxes for FY 1968 F-4 program. Naval Air Systems Command. N00019-68-C-0083
 - O. J. Beck & Sons, Corpus Christi, Tex. \$1,153,118. Construction of barracks at the Naval Air Station, Corpus Christi Naval Facilities Engineering Command NBy-95181.
 - 29-Teledyne Systems, Hawthorne, Calif. \$7,152,160. Self-contained navigation systems. Naval Air Systems Command. N00019-67-C-0189
 - Star Iron & Steel Co., Tacoma, Wash. \$6,409,100. Construction of four 100-ton floating cranes. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill.
 - Straightline Mfg. Co., Cornwell Heights, Pa. \$4,669,432. MK 82, MOD 1, conical bomb fin assemblies Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5394.
 - Construction Ltd., Bordentown, N.J. \$1,227,350 Construction of barracks at the Naval Air Station, Lakehurst, N.J. Naval Facilities Engineering Command. NBy 89154.
 - 31-Raytheon Co., Lexington, Mass. \$9,477,990. Sparrow III missiles. Lowell, Mass. Naval Air Systems Command. N00019-68-C-0225.
 - McDonnell-Douglas Corp., Long Beach, Calif. \$4,287,668. Multiple and triple ejector racks and related equipment Torrance, Calif. Naval Air Systems Command. N00019-67-C-0550.

DEPARTMENT OF THE AIR FORCE

- 1-Lockheed Aircraft, Marietta, Ga. \$1,267,294 Specialized engineering services for the C-130 fatigue analysis program. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09003-68-C-1335
- Hughes Aircraft, Los Angeles, Calif. \$1,961,882 Spare parts in support of airborne electronic equipment. El Segundo, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 93(657)-13402.
- 3-General Dynamics, Fort Worth, Tex. \$7,189,158. Inspection and repair of B-58 aircraft. Waco, Tex. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-C-0022 P011.
- Radiation Service Co., Melbourne, Fla. \$3,316,324. Operation, maintenance and repair of the ballistic missile re-entry data processing system at Holloman AFB, N.M. Air Force Missile Development Center, (AFSC), Holloman AFB, N.M.
- General Electric, West Lynn, Mass. \$1,417,817. Manufacture of spare parts for T-64 aircraft engines Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F33657-67-C-0054.
- AVCO Corp., Cincinnati, Ohio. \$4,403,836. Production of high frequency radio sets and related equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF33 (657)-15403.
- 6-General Electric, Cincinnati, Ohio. \$5,423,000. J-79 jet engines. Evendale, Ohio Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-CA-0030.
- General Electric, West Lynn, Mass. \$2,928,000. T-64 turboshaft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0463.
- Hughes Aircraft, Los Angeles, Calif. \$1,131,283. Production of spare parts for electronic countermeasure pods. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 33 (657)-13402-P00D-44.
- 7-Fairchild Hiller Corp., Farmingdale, N.Y. \$4,260,425. Modification and flight testing of the F-105 weapons delivery system; and \$1,200,000 in a second contract for modification of the F-105 flight control and navigation system. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-C-1055 and F04606-68-C-1056.
- Electronic Communications, St. Petersburg, Fla. \$1,180,432. Production of communications equipment for EC-135 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
- 8-General Electric, West Lynn, Mass. \$4,700,000. Engineering development work

- on the T-58 aircraft engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0730.
- General Electric, Syracuse, N.Y. \$1,587,850. Manufacture of radar antennae. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601-67-A-1470.
 - 9-Aerofet-General Corp., Sacramento, Calif. \$1,922,000. Pre-production work for future production of Stage II Minuteman missile motors Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0189
 - 10-Hoegge Co., Wichita, Kan. \$1,467,457. Production of electrical generator kits for modification of B-52 aircraft and ground support equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-3680.
 - 14-General Supply Corp., Limestone, Maine. \$1,039,877. Repair of base housing at Loring AFB, Maine Procurement Div., Loring AFB, Maine. F17600-68-C-0106.
 - Hycron Mfg. Co., Montevia, Calif. \$1,723,610. Production of aircraft cameras. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0194
 - Lockheed Aircraft, Marietta, Ga. \$2,150,000 Application of boron composite material to the leading edge wing slat of the C-5A aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0900.
 - 15-Fairchild Hiller Corp., Hagerstown, Md. \$1,631,222. Modifications to C-123 aircraft Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09003-68-C-0657
 - 16-Sandstrand Corp., Rockford, Ill. \$3,703,074. Production of aircraft constant speed drives and gear boxes. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-A-2298-0050.
 - 17-General Motors, Indianapolis, Ind. \$4,052,223. A program to improve T-58 engine components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F3365768 C 0366.
 - 20-Kentron Hawaii, Ltd., Honolulu, Hawaii \$1,000,360. Management and operation of the down-range station on Eniwetok Atoll, Marshall Islands. Air Force Western Test Range, Vandenberg AFB, Calif. F04607-68-C-0002.
 - 21-North American Rockwell Corp., Anaheim, Calif. \$5,244,651. Production of fire control systems for Italian-produced F-104 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-1384.
 - Liton Systems, Woodland Hills, Calif. \$1,313,002. RC-135 navigational instruments. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606-68-A-0147.
 - Sargent Fletcher Co., El Monte, Calif. \$1,852,801. Production of fuel tank assemblies for F-4 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F04606-68-A-0108-QP10.
 - 22-Fairchild Hiller, Farmingdale, N.Y. \$1,080,800. Installation of emergency flight control system kits for F-105 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601-67-A-3070
 - McDonnell Douglas Corp., Long Beach, Calif. \$1,680,242. Production of bomb release mechanisms for F-111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1247.
 - 24-Halliburton Co., Rolling Meadows, Ill. \$1,330,000. Research and laboratory experimentation for the improvement of electronic components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1823.
 - 27-Chicago Aerial Industries, Barrington, Ill. \$1,550,188. Airborne electronic optical reconnaissance systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1566.
 - ITEK Corp., Lincoln, Neb. \$1,140,060. Repair and modification of T-39 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. 04606-68-C-1016.
 - Honeywell, Inc., St. Petersburg, Fla. \$1,423,124. Development of an aircraft navigation subsystem. Minneapolis, Minn. Air Force Missile Development Center, Holloman AFB, N.M. F29000-68-C-0924.
 - 28-Chromalloy American Corp., San Antonio, Tex. \$2,299,094. Repair of jet engine compressor blades. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D-1617.

- 29—General Electric, Syracuse, N.Y. \$1,013.-474 Production of modification kits for aircraft radar systems Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601-68-A-2094.
- General Electric, West Lynn, Mass \$2.-579,950. Production of aircraft oxygen equipment Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1076.
- Lenkurt Electric Co., San Carlos, Calif. \$1,011,000 Production of communications equipment Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04006-68-A-0247.
- Houston Photo Products, Yuma, Ariz. \$1,747,762. Production of a film processing laboratory, Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F42800-68-C-3414.
- Texas Instruments, Dallas, Tex. \$1,500.-000. Aircraft ordnance equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1121.
- The following contracts for international airlift passenger and cargo service during FY 1969 have been awarded by the Military Airlift Command:
- Pan American, \$40,286,000.
 - Flying Tiger Line, \$27,283,000.
 - World Airways, \$27,048,000.
 - Continental Air Lines, \$23,713,000.
 - Branniff International, \$22,970,000.
 - Seaboard World Airlines, \$20,217,000.
 - Trans-World Airlines, \$19,439,000.
 - Northwest Orient Airlines, \$17,974,000.
 - Airlift International, \$14,080,000.
 - United Airlines, \$13,455,000.
 - Trans-International, \$13,078,000.
 - Trans-Caribbean Airways, \$12,342,000.
 - Capitol International, \$10,979,000.
 - Saturn Airways, \$5,601,000.
 - Eastern Airlines, \$4,766,000.
 - Overseas National Airways, \$4,436,000.
 - Universal Airlines, \$3,127,000.
 - Southern Air Transport, \$2,415,000.
 - American Flyers, \$1,806,000.
- 31—North American Rockwell Corp., Anaheim, Calif. \$124,430,840. Research and development for the post boost propulsion sub-system of Minuteman III missiles. Space & Missile System Organization, (AFSO), Los Angeles, Calif. F04701-68-C-0040.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$1,174,000. Launch services at the Eastern Test Range. Air Force Systems Command, F04701-68-C-0144.
- Santa Fe Engineers, Lancaster, Calif. \$1,829,871. Construction of a re-entry system assembly building for Minuteman III. Minot AFB, N.D. Ballistic Missile Construction Agency, Army Corps of Engineers, DA CA18-68-C-0003.

Industrial College Schedules National Security Seminars

The Industrial College of the Armed Forces, located in Washington, D.C., will conduct a series of National Security Seminars in seven cities throughout the United States during the 1968-1969 academic year.

Seminars are open to reserve officers of the Army, Navy, Air Force, Marine Corps, National Guard and Coast Guard. Industrial representatives and other interested civilians are also invited to attend.

Reservists may apply for enrollment through official military channels. Interested civilians may enroll through the Chamber of Commerce in any of the selected cities.

Each seminar consists of 33 illustrated talks, supplemented by films and a question-answer forum. The curriculum includes such subjects as World Industrial Development, Defense Management, Exploration of Space, Civil Defense and Industrial Readiness, International Economics and many others.

The Seminar schedule is: Provo, Utah, Oct. 14-25, 1968; Sioux Falls, S.D., Nov. 11-22, 1968; Battle Creek, Mich., Jan. 6-17, 1969; San Diego, Calif., Feb. 3-14, 1969; Dallas, Tex., March 3-14, 1969; West Palm Beach, Fla., April 14-25, 1969; and Columbia, S.C., May 5-16, 1969.

Radioisotope Heat Source May Improve Guidance System

It may soon be possible to reduce aircraft guidance system errors caused by temperature changes through use of a thermal preconditioning unit, now being developed jointly by the Air Force and the Atomic Energy Commission.

Testing is now under way at Wright-Patterson AFB, Ohio, by the Aeronautical Systems Division of the Air Force Systems Command to determine the efficiency of using a radioisotope heat source to keep guidance systems at or near the proper operating temperature.

Most systems now in use employ heaters to warm the sensors, which must be kept at precise temperatures to obtain adequate performance. But the time required for the sensors to be brought to proper operating temperatures has been too long in the past.

The Promethium-147 fueled thermal preconditioner, as the new radioisotope heat unit is called, will reduce the warm-up time by maintaining the entire inertial measuring unit near the operating temperature of the sensors.

A continuous temperature control unit has not been practical in the past because continuous electrical power could not be provided, and sources of portable power were not adequate to supply the heating requirements of a large inertial system.

Since the size of inertial systems has been decreased, operating temperatures can be maintained with less than 65 watts of thermal power, even at low temperatures.

The Promethium-147 heat source was designed and developed by the Atomic Energy Commission at the request of DOD. These units are being integrated and ground tested at Wright-Patterson laboratories at temperatures as low as 65 degrees below zero. Flight tests of the unit will be made at Holloman AFB, N.M.

Captain Donald G. DePree of the Office of the Deputy for Engineering, Aeronautical Systems Division, is project officer for the heat source unit.

Navy Publishes Business Guide

The Navy Ship's Store Office has published a 20-page brochure, "A Guide for Doing Business with the Navy Resale System," to advise large and small manufacturers or prime suppliers.

The brochure discusses business procedures involving the four programs of the Navy Resale System including navy exchanges, commissary stores, military sea transportation service exchanges, and ship's stores afloat.

A list of Navy Resale System outlets around the world is also included.

Copies of the booklet can be obtained from Public Affairs Office, Navy Ship's Store Office, Third Ave. and 29th St., Brooklyn, N.Y. 11232.

Flight Actuators Meet Gunfire Tests

The Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, has begun a program to determine how badly aircraft flight control actuators are damaged by small arms gunfire.

During the next year, actuators donated by 11 vendors will undergo impact testing by .30 and .50 caliber armor-piercing and incendiary projectiles.

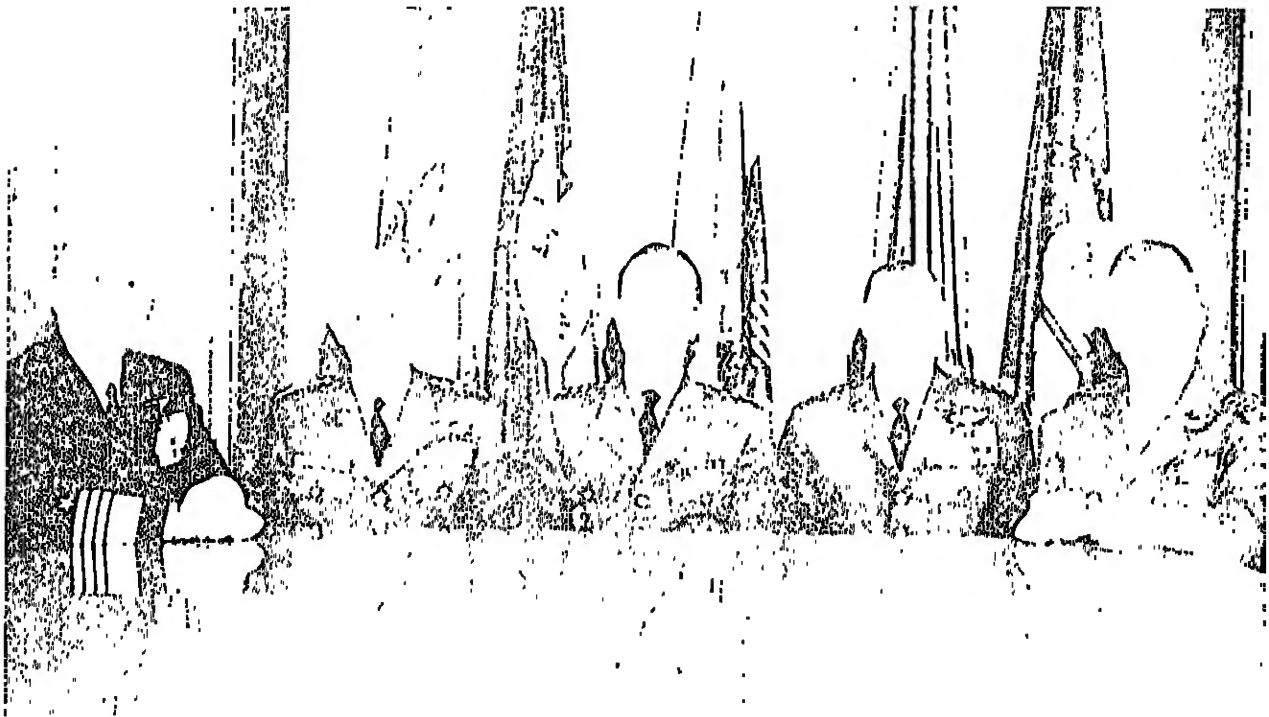
According to F. R. Taylor, program manager, test data could be used to improve actuator design and develop better hydraulic fluids, armor plating and projectile deflectors. Test results will be made available to government and industrial organizations.

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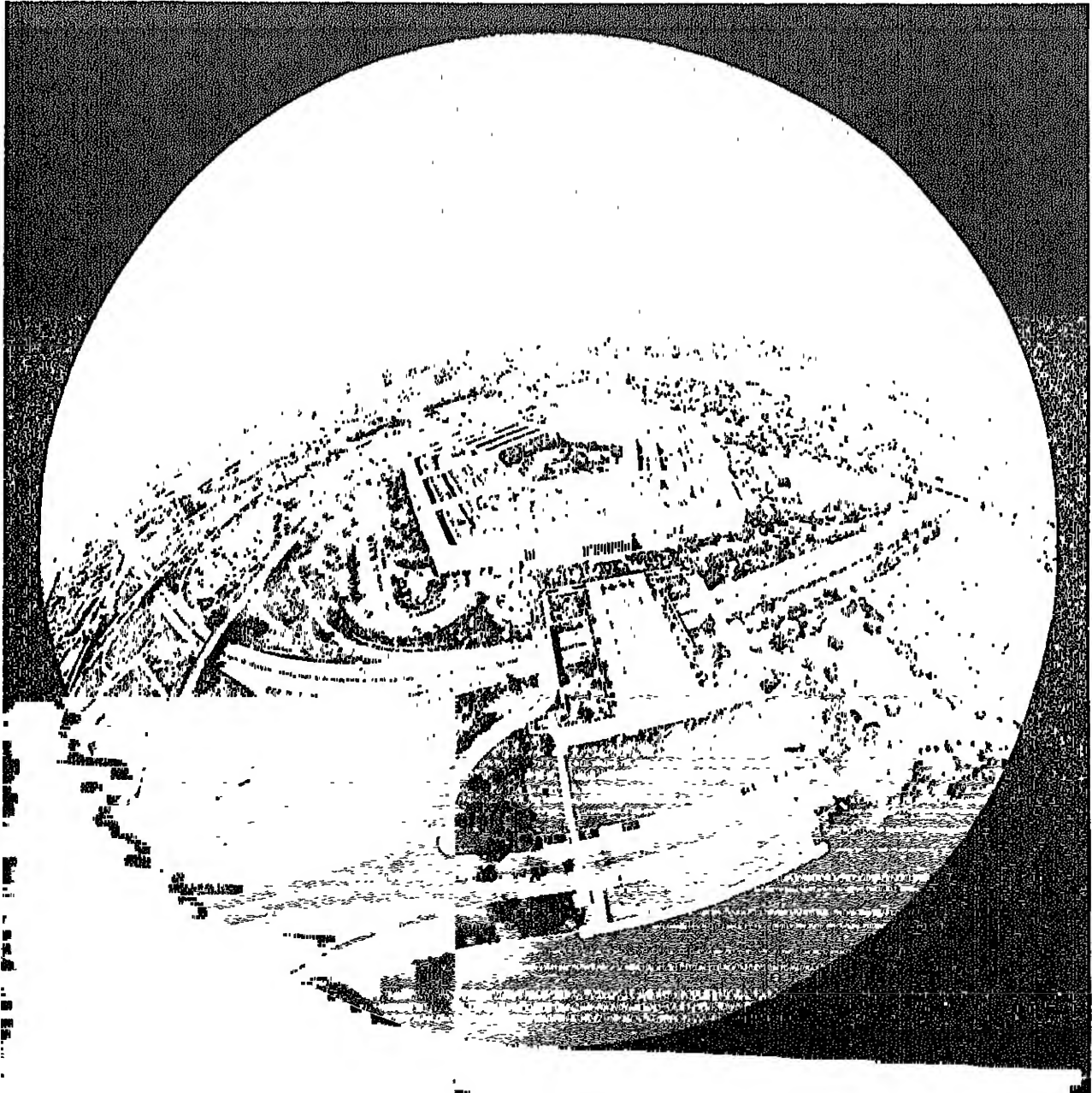
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DEFENSE INDUSTRY BULLETIN

Vol. 4 No. 8

August 1968



The Pentagon—A Bird's Eye View

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

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About the Cover



The Pentagon as seen by Chief Photographer's Mate Richard R. Stover's "fish eye" lens from 500 feet in a U.S. Army H-21 helicopter.

Foundations for the Future

General James Ferguson, USAF

We pride ourselves in this country on our technical leadership, our production competence, and our problem-solving capacity. We have lived so long in technical and scientific affluence that we believe anything is possible by pushing a button, or by building the button for someone to push.

Nevertheless, I am concerned today about our "foundations for the future." I refer to those large, complex, and often costly aerospace test facilities which form the base for technological incubation and progress in this country. Among these are our vast test ranges with their instrumentation, our various scientific laboratories, environmental chambers and wind tunnels, and the launch and test stands for our missile and space programs.

These are national resources in the sense that they serve national interests, are shared by all agencies of the Government and our industry associates, and are of such cost and complexity as to prohibit duplication.

Further, they represent capital investments, directly or indirectly, on the part of the Government—similar to the kinds of long-range investments which industry must make from time to time in plants and equipment to assure continued ability to operate profitably and compete effectively.

I am concerned about these national resources for four reasons:

- First, industry and the Air Force Systems Command (AFSC) are jointly and professionally conscious of the need for preparedness, military and industrial. Advanced research and test facilities are long lead-time items essential to our future preparedness posture.
- Second, until recently the facilities built 15 to 20 years ago have

been adequate, with modifications and additions, to meet our needs. Now, with the advent of the jumbo jets, the supersonic transport (SST), advanced manned space missions, and the possibilities of travel in the hypersonic flight regime, we are stretching present-day facilities to a thin point and reaching a limit in our ability to "make do" on a year-to-year basis.

- Third, there is clear evidence that the Soviets are emphasizing progressive research, test and technical facilities, and that they are taking some giant steps in these directions. We have learned in recent years some harsh, but perhaps enlightening, lessons on the costs and consequences of allowing reaction or inaction to

displace action as the moving force in the timing of national ventures. The United States did not test the first ballistic missile or launch the world's first satellite. The first SST to fly will, in all probability, not be stamped "Made in America." Without the assurance of adequate and ample test facilities for the future, the initial applications of other new technologies may likewise escape us.

- Fourth, there is no imaginative, comprehensive, long-range plan for the design, development and acquisition of those facilities which will be needed to provide the critical simulation environments, dimensions, and time durations for future system testing. I feel that such a plan is needed, just as surely as such facilities will be needed.

It must be a plan, national in scope, formulated jointly by all who are responsible for preparedness through resourcefulness.

Recently, the Aeronautics Panel of the National Aeronautics and Astronautics Coordinating Board was asked to formulate an integrated aeronautical facilities program which will support facilities development in that important area.

But, it is appropriate that we in AFSC and industry should also ponder this problem together. Our objectives in AFSC are to sharpen our advocacy of new programs and capabilities, to work toward improved responsiveness to our country's military needs, to stay within forecast dollars for on-going and approved programs, and to strengthen our ability to conduct future research and development projects more cost-effectively. These are goals we can meet or undertake only by working more closely with our partners in industry.



General James Ferguson, USAF, is Commander, Air Force Systems Command (AFSC), Andrews AFB, Md., and Director of the Manned Orbiting Laboratory program. In previous assignments he was Deputy Chief of Staff for Research and Development, USAF, and before that Vice Commander, Air Research and Development Command (later designated AFSC).

Test Facility Must Precede Technology

I am sure that some of the causes for concern which I feel will also be recognized by industry as challenges to our national well-being.

In the first place, large aerospace test facilities and their "furnishings" are hardly mass-production items. A highly advanced, precision test facility may take three to five years to design and develop, and possibly another two or three years to construct. For planning purposes, we must add the time required for budget justifications and approval, and for funding under military construction appropriations. I'll have more to say about this a little later.

The point is that the kinds of facilities we are talking about must "pace" the state of the art. They must be well "ahead of their time" with respect to research and development programs and a generation ahead of production requirements. Accordingly, it is virtually impossible to advocate a major new facility on the strength of specific future programs, for in many cases the facility must exist before the technologies necessary to the program can be identified.

The Wright Brothers and their predecessors, for example, used wind tunnels to determine the relative lift efficiencies of variously shaped and differently curved wings. Similarly, we would have had great difficulty developing a rocket engine restartable in space if we hadn't possessed high vacuum "space" chambers where the environment could be simulated, or to diagnose problems and failures we experience in the development process.

As a corollary to this observation that facilities must precede programs, it is interesting to note that historically new facilities are seldom used for—or at least confirmed to—the purposes for which they were intended.

The Central Inertial Guidance Test Facility (CIGTF) at Holloman AFB, N.M., for instance, was first designed for the testing of gyroscopes. Along with the seven-mile, high-speed sled track, also at Holloman, the guidance facility has since proven to be indispensable in the development of the ballistic missile, and both are now

used for testing inertial navigation systems for aircraft (such as the F-111 avionics package), for testing terminal seekers used on air-to-ground missiles, and for a variety of other purposes. The sled track has proven especially versatile; only about 15 percent of utilization today is in support of guidance tests.

As a matter of fact, the entire \$42 million cost of the CIGTF was more than amortized by its contributions to the ballistic missile program. The launch of the first Minuteman ICBM was completely successful. Yet, any one of the six deficiencies first detected in the Holloman tests of the guidance system could have caused it to fail. I might also add that some of the shortcomings on the Minuteman II system, now corrected, were picked up in our Holloman tests.

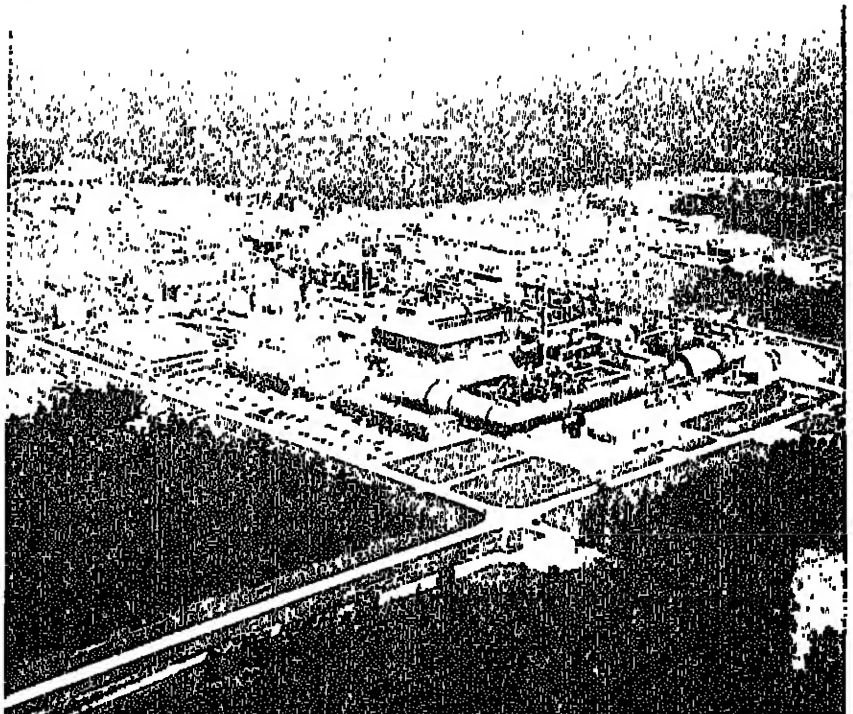
Of course, the sled track facility has now become an established national resource, and for many reasons. It is used for nose cone materials tests, impact tests, and we ran more than 80 tests to check out the cockpit module escape system for the F-111. Half of those runs were made to verify corrections, and we have had two instances and there are four men

alive today who are glad that we could do this kind of testing at ground level.

National preparedness is neither a sometime thing nor a result of random actions. It must be deliberate and it can result only from perceptive planning and dynamic programming.

I think the late Dr. Theodore von Karman was one of the first and most successful practitioners of the "new" art of technological progressiveness. He recognized, for example, that imaginative and well endowed test facilities are the very roots of national preparedness.

While the Air Force's inventory of research facilities dates back more than 50 years, to the 1917 establishment of McCook Field in Ohio (predecessor to Wright-Patterson), Dr. von Karman's famed "Toward New Horizons" report of 1945 must be credited with greatly increasing the respect of the military for scientific and technical possibilities; just as von Karman's advice to General Hap Arnold in the late 1930s helped break loose the major facility expansion of Wright Field, including the 40,000 horsepower wind tunnel and all the laboratories there.



Arnold Engineering Development Center, Tenn., includes high performance wind tunnels, high altitude simulation propulsion test cells, and space simulation chambers.

After World War II, von Karman reported that the substantial German technical progress was "not the result of any superiority in their personnel or engineering competence, but rather was due to the very substantial support enjoyed by their research institution in obtaining expensive research equipment, such as large supersonic wind tunnels, many years before such facilities were even planned in this country."

By using such facilities the Germans, for example, were able to go from initial design to actual flight of the V-2 in under two years—a remarkable achievement in aerodynamics by the standards of the 1940s.

I might point out, incidentally, that some of the German equipment, primarily compressor and exhaust machinery, is still in operation at our Arnold Engineering Development Center, Tenn., after 20-plus years.

The von Karman "shopping list" of nearly a quarter of a century ago called for wind tunnel facilities capable of speeds "up to three times the speed of sound," with large enough test sections to accommodate models of "reasonably large size" including jet propulsion units, and one ultrasonic wind tunnel "for exploration

of the upper frontier of the supersonic speed range." He also urged ample facilities "for the study of combustion and other characteristics of propulsion systems at very high altitudes."

These represented exceedingly ambitious objectives 25 years ago, when the sound barrier was considered an insurmountable obstacle. Justifying such facilities on the basis of specific program needs would have taken some fancy footwork indeed.

Today's Needs Exceed Current Capability

Now, secondly, I said I was concerned because our "try-before-you-fly" facilities of earlier years are reaching the outer limits of usefulness.

For example, just 10 years ago we were quite proud of the fact that we could obtain a mass airflow of 400 pounds a second through one of the engine test cells at our Arnold Center. That was more than we needed.

Today, however, we're testing engines for the C-5A and the SST. The TF-39 engine for the C-5A transport is so large and gulps such tremendous amounts of air that a mass flow of

1,500 pounds per second is required at sea level, which exceeds our current capability.

Accordingly, there is no wind tunnel in the free world capable of testing the TF-39 engine in the portion of its performance envelope ranging from sea level to about 5,000 feet. If the next generation engine reaches the 60,000-pound thrust level, entirely possible, no part of the operating envelope will be available to proper simulation, using available facilities. (As a substitute for the present low altitude testing deficiencies, we have mounted a C-5A engine on a B-52 and conducted flight tests. In this sense we're going against historical experience. Over the years we have found that a much greater volume of data can be obtained in a single hour of test cell operations than can be obtained in many days of flight testing.)

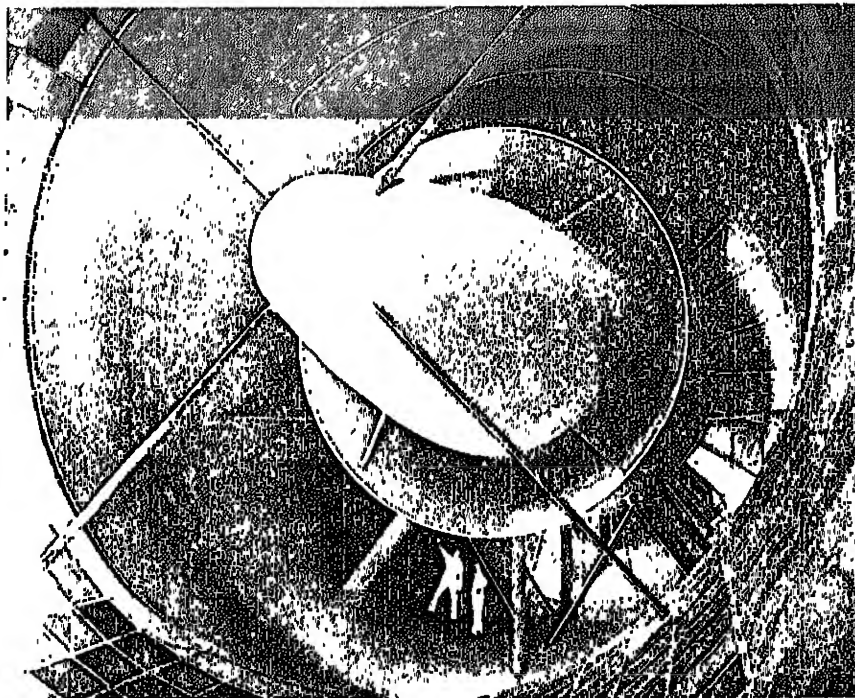
The GE-4 engine for the SST operates on a lesser airflow—620 pounds per second—but it requires higher inlet temperatures and pressures than we can presently simulate.

General McKee, as Federal Aviation Administration (FAA) administrator, told me that his agency was concerned because engine growth is rapidly out-pacing the capability for engine test. He called that "a situation in need of correction" and pointed out that it is also unfortunate that only one large, airbreathing, engine test cell is available to us today and it is marginal. We will, for example, follow the current TF-39 tests in this cell with tests of the SST engine beginning early in 1969.

General McKee did not consider this an isolated case. "Parallel development programs for large engines are bound to occur in the future," he said.

There are a number of other major facility needs of a national character. Let me mention just a few of them.

For one, we need a wind tunnel that will enable us to test a vertical takeoff and landing (VTOL) aircraft over the entire performance range of its transition from vertical to horizontal flight. Perhaps the lack of such a facility partially explains why there have been 55 VTOL, or vertical and/or short takeoff and landing (V/STOL), projects and 36 VTOL aircraft built in recent years—all



Compressor for large supersonic tunnel at the \$400 million Arnold Engineering Development Center consists of 18 stages. It weighs 878 tons and is 205 feet long.

without sufficient success to justify production.

A second indicated need is for a 200-foot vacuum chamber capable of simulating the space environment. A chamber this size would permit the testing of complete space vehicles, including provisions for docking and for extravehicular personnel excursions.

Third, the effectiveness of our defensive ballistic missiles could be improved, if we had a shock interaction facility to simulate the aerodynamic flow and strong shock generated over warhead models. This would involve shock tubes capable of superimposing a simulated, nuclear-blast shock wave on a test model enabling us to study and validate shock interaction theories.

A fourth need, and one we have been aware of for several years, is for a true temperature tunnel (TRIPLETEE), a hypersonic wind tunnel capable of duplicating flight conditions at hypersonic speeds and temperatures.

Some industry proponents claim that hypersonic transport (HST) technology today is just about where SST technologies were in 1954 or 1955. Really meaningful progress in achieving the ten-fold speed transition, from present jet transports to the HST, however, will depend on greatly extending our knowledge in materials, in cooling technologies, in hypersonic aerodynamic and propulsion technologies, and in the integration of the airframe and the propulsion system.

As an example of the temperature extremes involved, the leading edge of the HST wing will heat to 2,000 degrees F. (four or five times higher than the SST), while the fuel tanks will have to hold the liquid hydrogen at a temperature of minus 423 degrees.

Although requirements like these seem quite challenging today, the TRIPLETEE would enable us to solve many of the temperature, aerodynamics and propulsion problems to be encountered in hypervelocity flight.

TRIPLETEE is an example of the way we in the Defense Department must continuously and collectively peer into the future, and bring both foresight and insight to bear on the obstacles and opportunities ahead of us there. We share a common responsibility, at both the advocacy and approval levels, to identify the fac-

ilities needed and to do so in sufficient time to plan and acquire them.

We do not need to peer into the future at all to recognize another need which the right kind of facility might satisfy.

The situation which continues to frustrate us in Southeast Asia suggests that we might well benefit, substantially, from a synthetic battleground where those things peculiar to modern warfare at the so-called "limited" level could be tested. No such "full spectrum" battle simulator exists today, in either concept or prototype form.

Surely, we can no longer delude ourselves that the term "limited" can be equated with "simple" or insignificant. Whatever the condition of the country engaged in aggression, the battles fought over that country can involve clever people and highly sophisticated weapons. Furthermore, where technology is not native to a country, it can easily and quickly be imported. The illusion that our enemies are night crawlers in black pajamas, poorly armed and poorly fed, is the great myth of the Vietnam conflict.

Accordingly, facilities which would enable us to test electronic gear, air-

craft and other weapons, and advanced munitions in accurately simulated combat environments would go a long way toward improving our capability to fight or deter future wars.

The third area of concern, I mentioned earlier, was the possibility of losing technological leadership to those who have learned from us the fundamental importance of owning facilities adequate to explore the unknown and to test the uncertain and untried.

While much of what the Soviets are doing in their research and development programs is not visible (or does not "show up" until the hardware stage), there are, of course, certain indications of their actions.

A review of Soviet patent releases, for example, reveals that they are making considerable progress in advanced wind tunnels, propulsion test cells, and space chambers. Their low density, wind tunnel facilities are reportedly the equal of anything in the United States. Izvestia has printed pictures of the AN-22, the large Soviet airplane exhibited at the Paris air show, undergoing model tests in a wind tunnel.



Wearing a space suit and helmet in an underwater environment that closely simulates space, First Lieutenant Daniel Seger tests a power tool developed for use by astronauts. The tests were performed in a swimming pool at the Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio.

In the space area, a Soviet aeromedical scientist spoke at a recent astronautical conference on the exacting simulation tests to which their space crews and vehicles are subjected. And it has been reported that every command given to the USSR Venus probe was first given to a duplicate vehicle in a space environmental chamber.

We are keeping an eye on facility developments overseas since an awareness of our opponents' test capabilities can furnish us some insight into their military pursuits or signal their technological intentions. It remains, of course, for us to act wisely on what we observe or deduce.

My fourth and final concern pertains to the importance of continuing to recognize our major research and test facilities as national resources in the best sense of that word.

They are national, first, by virtue of their diversity.

In any single week, the \$1.5 billion of national facilities, entrusted to the stewardship of AFSC, are being used for hundreds of purposes, ranging from the testing of new counterinsurgency equipment to the simulation of a nuclear explosion.

In addition to our own in-house requirements, these facilities are being utilized by the Army, the Navy, National Aeronautics and Space Administration (NASA), the Atomic Energy Commission, the FAA, Advanced Research Projects Agency (ARPA), Defense Communications Agency (DCA), the major air commands, and the many American companies doing business with and for the Government.

In support of national needs, ranging from Vietnam to space, AFSC facilities are being used for such diverse purposes as testing a new five-kilowatt fuel cell that may be used as a power supply for the advanced versions of the Manned Orbiting Laboratory, developing a plasma arc lamp for better battlefield illumination, subjecting the panels and boron composite sections of the F-111 to sonic fatigue tests, running bullet impact tests for the purpose of reducing the vulnerability of combat aircraft, and determining the effect of micrometeorites on spacecraft.

The facilities we manage are national resources, secondly, by virtue of their broad applications.

Along with the military and space programs these facilities support, there are a variety of other applications of national significance which they serve.

- The 15,000-foot instrumented runway and excellent weight and balance facility at Edwards AFB, Calif., have been made available in support of the DC-8, DC-9, 727 and 737 jetliner certifications.

- At the Inhalation Exposure Facility of our Aerospace Medical Laboratory, technicians are studying the implications of long-term exposure to common chemicals threatening pollution to the atmosphere. The findings of these studies will be applied to the Federal standards being set for "clean air."

- That same laboratory's Bio-Acoustic Research Facility is measuring possible effects of the sonic boom on communities, and collaborating with other Federal agencies in auto crash research.

- At Cape Kennedy, Air Force tracking equipment has been used to track commercial communication satellites from launch to orbit.

These facilities are national resources, third, by virtue of their value to our economy and our national objectives.

Over the years, tests in large environmental facilities have saved many years, many lives, and many millions of dollars in the development of vital aerospace systems. While testing in these facilities can never completely replace flight testing, ground tests have been confirmed as the only way to reasonably assure that the first flight attempt will have a good chance for success.

A spokesman for NASA, for example, told us recently that the superior test program conducted at our Arnold facility on their J-2 engine gave NASA the final measures of confidence they needed to go ahead with the first Saturn flight test. These facilities cost a few millions of dollar. Consider what the costs would be of a single Saturn flight failure.

We also feel that through the years the large test facilities in our national inventory have given American industry an unbiased proving grounds, where their products and technologies can get objective testing, and enable firms to compete according to com-

mon performance standards and conditions.

Facilities afford us a hard-data test bed for the clinical evaluation of proposed hardware. When we issued requests for proposals for the inertial navigation for the F-111 Mark II avionics package, we had 13 competitive systems proposed. Instead of having to make a choice strictly on the paper presentations, we applied the hardware to the test environment and attained sound data to use as a decision basis.

Sometimes our customers get more than they bargain for. At Holloman AFB recently we were sled-track testing a guidance subsystem for a potential contractor. The purpose was to use the sled to simulate rocket lift-off vibrations. But the sled malfunctioned on the test run, overshot its water brakes, and sailed off the north end of the track at about 125 miles per hour. Data revealed that the test item had continued to function after the incident. So the customer got three tests—sled, flight and impact—all for the price of one.

Problems of Future Facilities Planning

In projecting the kinds of facilities being discussed into the future, there are two problems that will have to be overcome. One is our ability to identify, program, and build technical facilities advanced enough to serve future requirements. The second problem is to be persuasive enough in our proposals to merit the confidence of the decision makers in approving facilities to support systems still in the "possibility" stage.

As mentioned earlier, it is hard to match this requirement against such clearly identified needs as more aircraft, additional ballistic missiles, better limited war equipment, or improved personnel living quarters.

Nevertheless, the problem of timely acquisition is becoming critical. The resources so useful to the nation today must be assured for tomorrow. We need to recapture the spirit of Arnold and the foresight of von Karman, if we are again to reach far out into the future in our facilities planning.

Unfortunately, while many of yesterday's test facilities were relatively simple and inexpensive, those needed

(Continued on Page 16)

Management Systems Control— A Progress Report

Colonel Albert W. Buesking, USAF

During the past 15 months since I first reported on actions being taken to effect management systems control within DOD (see article "Management Systems Control," *Defense Industry Bulletin*, March 1967, page 26), a significant development in management improvement has taken place. There has been increasing concern with the proliferation of management controls and reporting requirements applied on DOD contracts for the acquisition of goods and services. In May 1966, the Aerospace Industries Association presented the Systems Management Analysis Group (SMAG) Report to the Defense Industry Advisory Council. At about the same time Robert N. Anthony, Assistant Secretary of Defense (Comptroller), was voicing his concern with the same problem. In a speech delivered in March 1966, Mr. Anthony remarked:

During the last decade the Military Departments have developed and produced a wide variety of weapon and support systems, and they have also designed a wide variety of Management Systems for dealing with these major acquisitions. Each manager has separately wrestled with the problem of devising a system for describing plans, for measuring and controlling progress against these plans, and for recording experience so that the estimating and management job could be done better next time. The result has been a proliferation of systems, reports and acronyms.

A Department of Defense/Council of Defense and Space Industry Associations (CODSIA) Advisory Committee was established to report to

Mr. Anthony and conduct an evaluation of the problem during the two-year period starting in November 1966. The work was divided into three distinct phases as follows:

- Phase I covering the initial planning completed in January 1967.
- Phase II covering the need-use analysis of selected management systems, the development of principles and procedures, and preparation of two DOD instructions completed on March 31, 1968.
- Phase III covering the actual implementation of the results of



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Phase II and scheduled for completion by mid-1970.

With the completion of Phase I the findings of the DOD/CODSIA Advisory Committee were published in the Final Report, dated May 1968, and the control mechanism was approved by Mr. Anthony in May 1968.

The Final Report dealt with two key tasks identified by the DOD/CODSIA Advisory Committee:

- The preventive job of forestalling undesirable proliferation of management control systems in the future.
- The corrective job of reducing existing proliferation.

The report, comprised of four volumes, deals broadly with three issues and six appended studies of the operation of existing management control systems in selected functional areas (systems engineering, integrated logistic support, finance and schedule work breakdown structure, data management, and DOD source documents).

Volume I introduces and emphasizes the concept of a "management control system" as an analytic framework for evaluating how well DOD system documents perform the functions for which they are designed. It defines the concept as follows:

A management control system is an orderly way, generally including a documented procedure, of assisting managers in defining or stating policy, objectives and requirements; assigning responsibility; achieving effective utilization of resources; periodically measuring performance; comparing that performance against stated objectives and requirements; and taking action.

The use of this framework led to the recognition of several incisive points with respect to DOD management practices:

- DOD parent management system documents, in many cases, do not fit together to operate as parts of an efficient system, but rather develop, duplicate and, occasionally, conflict with each other.

- Among the causes of these difficulties are the functional orientation of some documents, the breadth of statement of objectives, the varying definition of terminology, and the

non-uniform implementation of some broadly worded DOD documents.

- Management systems designers could help to alleviate these problems by constructing their systems with a view to achieving a clearly envisioned mode of management: visibility, surveillance, or prior approval.

Volume IV represents a summary of the "need/use" reports worked on by the DOD/CODSIA teams and contained in the appendixes of the Final Report. Among the specific recommendations made in Volume IV are:

- The need for the development of

a total integrated systems engineering concept.

- The need for greater implementation of the concept of integrated logistic support by extending systems engineering concepts and practices into the operational phase.

- The mandatory use of a single work breakdown structure to correlate technical performance, schedule and cost information.

- The development of better integration of the several reporting requirements in the finance and schedule area.

- The creation of a DOD Authorized Data List.

Volume III of the report sets up the framework for the implementation of the recommendations mentioned before. Specific plans in the areas previously cited have been developed to support this Master Implementation Plan.

Volume II describes the working of the control system for new management proposals developed by the DOD/CODSIA Committee and ultimately crystallized in DOD instructions recently signed by Mr. Anthony. It is worthwhile to look at the operation of this control system in some detail. The control system is comprised of three parts:

- An instruction on the Development of Management Control Systems, DOD Instruction 7000.6, June 6, 1968, (the development instruction).*

- A Management Control Systems List (MCSL) published as a supplement to Armed Services Procurement Regulation (ASPR).

- An instruction on the Selection and Application of Management Control Systems, DOD Instruction 7000.7, June 6, 1968, (the application instruction).*

Development Instruction

The development instruction provides that only management control systems listed on the Management Control Systems List may be contractually applied. All existing systems have been placed on the list. All

**Non-subscribers to the service for obtaining copies of DOD Directives and instructions may obtain referenced DOD instructions, one copy per request, from: Naval Supply Depot, Attention: Code 300, 5801 Tabor Avenue, Philadelphia, Pa. 19120.*

Review on Proposals Under the Development Instruction

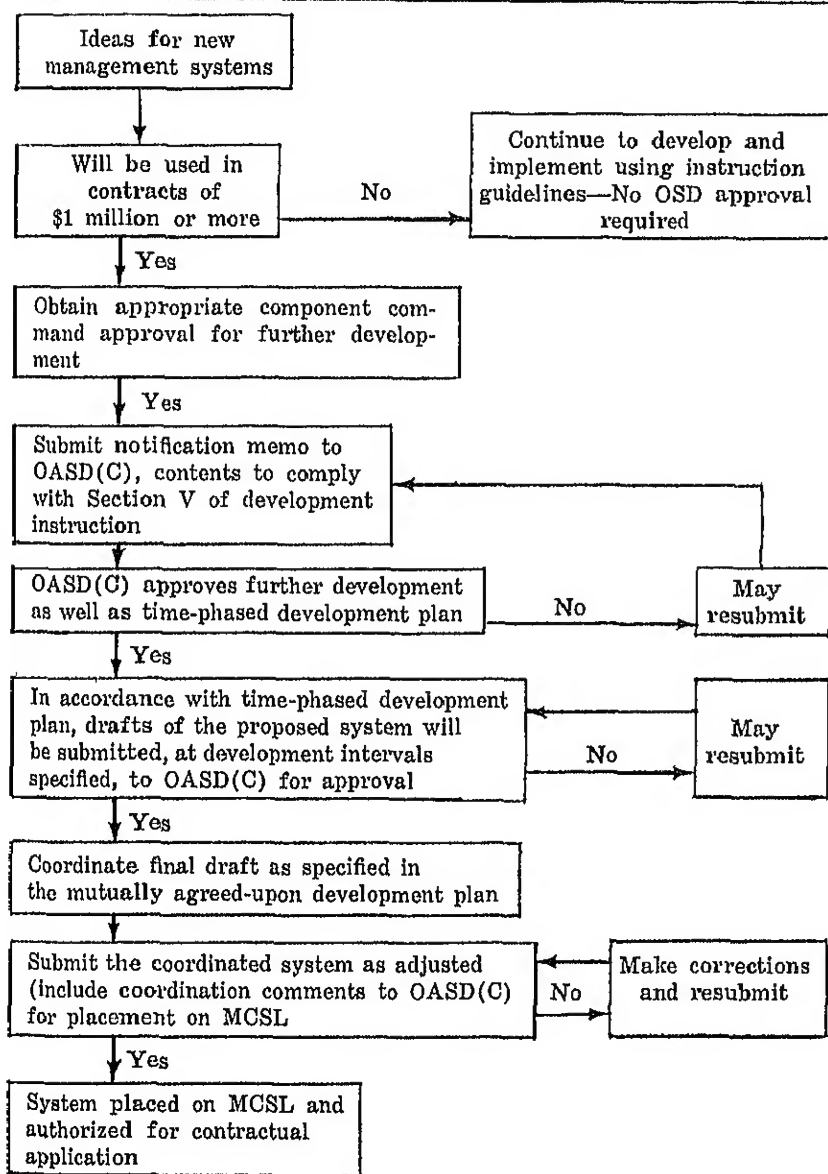


Figure 1.

proposed new or substantially modified systems must pass through the approval procedures portrayed in Figure 1, prior to contractual application. Basically, these procedures simply call for determination by the Assistant Secretary of Defense (Comptroller), in conjunction with the office of primary responsibility in the Office of the Secretary of Defense, that a proposed management control system is not redundant with respect to existing systems, and that it will in fact optimally serve the objectives for which it is designed.

MCSL Content

The MCSL is designed for use by both systems designers and line managers. Each document is indexed and cross referenced in such a way that it may be readily called out of the automated file. It is hoped that by grouping documents in such manner enabling quick comparison by function, life-cycle stage, etc., both systems designers and line managers can be better equipped to help prevent future overlaps in intent, function, or data product call-out of management control systems.

Application Instruction

The application instruction is designed to provide guidance to program/project managers in the selection of management control systems from the MCSL and their application to the contract, through their listing on the new DD Form 1660 (Management Control Systems Summary List). No management control system or any of its associated data products may be contractually required in the absence of listing on the DD Form 1660. Figure 2 illustrates the operation of this instruction.

The objectives of this instruction are fundamentally threefold:

- To assure that management control systems are used to assist in managing the acquisition, and not as an end in themselves.
- To assure that more than one management control system, calling for data satisfying the same DOD management requirement, will not be specified on a contract.
- To orient managers toward the selection of management control systems which consistently implement a "mode of management."

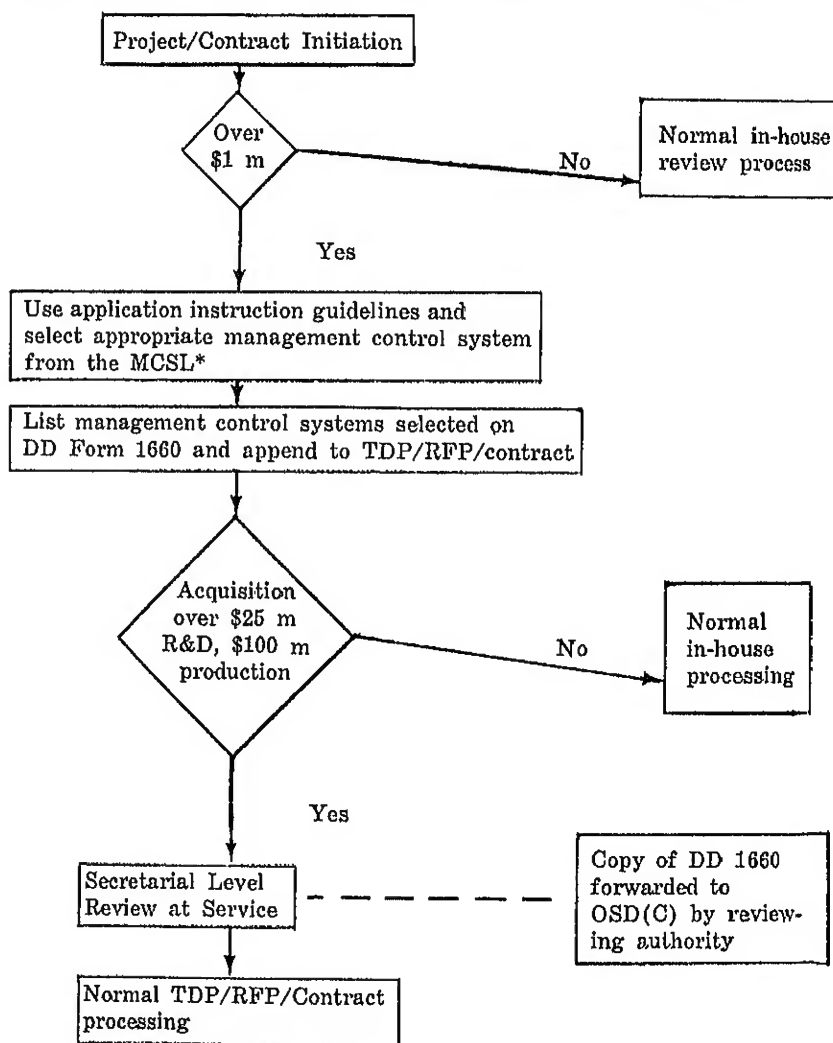
As discussed in the application instruction, a mode of management is the type of constraint which a group of management control systems, applied by a program/project manager, collectively impose on a contractor. The modes of management are defined as:

- "Visibility"—An identifiable contractor's management control system exists and its elements can be made available for government examination, as required.
- "Surveillance"—The examination of the contractor's status through the

media of government-specified periodic reports, but without prior government review and sanction of specified contractor actions.

The application instruction seeks to relate selection of the mode of management to the variables in the contractual environment which have been defined in ASPR and other official DOD documentation, including nature of work, life-cycle phase, and degree of risk shifted by a contract to the contractor. The instruction also introduces the concept of the downward "tailoring" of management con-

The Role of the Application Instruction



*Note: Development instruction governs accession of management control systems to MCSL.

Figure 2.

trol systems to fit the mode of management selected for a particular acquisition. It recommends the deletion of those data product requirements of a management control system which are not, in the light of all of the facts surrounding the acquisition, necessary for adequate DOD management.

Conversion of the MCSL into an Authorized MCSL

As a result of follow-through on the Implementation Plan for the modification of existing management control systems, described before, and the operation of the control system, more and more management control systems will receive approval by the Assistant Secretary of Defense (Comptroller). The need for many previously utilized, procedurally oriented documents will be removed by the issuance of new documents, and they will be deleted from the MCSL. Ultimately, then, an "Authorized" MCSL will be published. Only management control systems authorized for application by the Assistant Secretary of Defense (Comptroller) will be contained in the Authorized MCSL.

The Job Tomorrow

The formal promulgation of the Management Control Systems List and associated instructions represent the beginning rather than the end of the systems control effort. In part, its success will depend upon the ability of Assistance Secretary of Defense (Comptroller) to rapidly process requests for new management control systems, and thus avoid being a bottleneck in the overall management of programs. In major part, however, the effectiveness of the control plan will depend on the efforts of those who must live with it. DOD managers must take the time and trouble to evaluate the adequacy of documents already on hand before deciding to create their own forms. Staff managers must orient themselves toward developing broad criteria type systems. In sum, the management systems control program is not a lance to joust at paper dragons, but simply a way to assure that people do the best they can with what they have at hand.

New Research Programs Selected Under Project THEMIS

Forty-three new research programs have been selected by the Defense Department to be performed at universities located in 24 states and the District of Columbia under Project THEMIS.

Objectives of the project THEMIS, initiated last year, are:

- The development of new academic centers of excellence capable of contributing basic knowledge toward the solution of important defense problems in the future.

- Wider geographical distribution of defense research funds, giving preference to institutions that receive little or no DOD support.

These research programs are unclassified.

In 1968, 412 research proposals were submitted. A preliminary screening reduced the number to 96. Following on-site visits and in-depth evaluations of each remaining program, the 48 programs identified in the following list were selected:

University of Arizona. Precision optical systems.

Arizona State University. Detection devices, techniques, theory.

Catholic University. Vitreous state structure and dynamics. Dynamics of cable systems.

Colorado State University. Tropical weather disturbances, surface effects. Predictability of low-altitude winds.

University of Cincinnati. Internal aerodynamics, air-breathing engines.

University of Connecticut. Structural fatigue.

Drexel Institute of Technology. Powder metallurgy. Forecasting by satellite observations.

Florida State University. Prediction of tropical weather phenomena. Computer assisted instructions and training.

University of Hawaii. On-line computer systems.

Illinois Institute of Technology. V/STOL aerodynamics.

University of Iowa. Vibration and stability of military vehicles. Application and theory of automata.

Jefferson Medical College. Pathogenesis of acute diarrheal disease.

Kansas State University. Electronic components, nuclear radiation effects.

Kent State University. Liquid crystal detectors.

University of Kentucky. Metal deformation processing.

Lehigh University. Non-linear wave propagation. Low-cycle fatigue in joined structures.

University of Louisville. Performance assessment and enhancement.

University of Mississippi. Biocontrol systems.

University of Missouri (Rolla). Aqueous aerosols in atmospheric processes.

North Carolina State University. Digital encoding systems.

University of North Dakota. High pressure physiology.

North Dakota State University. Control of vectors of diseases of military importance.

University of Oklahoma. Mechanism and therapy of shock.

Rensselaer Polytechnic Institute. Electrochemical power sources. Radiation effects on electronic materials.

Rice University. Coherent and incoherent EM radiation.

Medical College of South Carolina. Resuscitation and treatment of wounded.

Southern Methodist University. Statistics in calibration methods.

Stevens Institute of Technology. Evaluation of terrain-vehicle systems.

University of Tennessee. MHD power generation. Remote sensors for environmental systems.

Texas A&M University. Aircraft dynamics for subsonic flight.

Texas Technological College. Human performance under stress.

Vanderbilt University. Coating science and technology.

University of Vermont. Isolation and sensory communication.

University of Virginia. Atomic interactions in gases.

West Virginia University. V/STOL aerodynamics.

Hubbell Report Recommends Change in Military Pay System

[Editor's Note: This article was prepared by the staff of the Military Compensation Policy Board under the direction of Rear Admiral Lester E. Hubbell, USN.]

In April 1968, Secretary of Defense Clark M. Clifford sent to Congress the results of the first quadrennial review of the military pay structure. The first portion of the report, on active duty pay, recommended "the most fundamental change ever proposed in the military compensation compensation system."

The study of military pay was made to comply with Section 1008(b), Title 37, U. S. Code, which requires the President at least every four years to "... direct a complete review of the principles and concepts of the compensation system for members of the uniformed services . . ." and to "... submit a detailed report to the Congress summarizing the results of such review together with any recommendations he may have proposing changes in the statutory salary system and other elements of the compensation structure provided members of the uniformed services."

The Military Compensation Policy Board,² made two initial policy decisions:

- No uniformed service member

¹Memorandum transmitting Summary of First Quadrennial Pay Study to the Secretary of Defense from the Military Compensation Policy Board.

²Chaired by the Assistant Secretary of Defense (Manpower and Reserve Affairs) and comprised of the Service Under Secretaries and Deputy Under Secretaries for Manpower, the Assistant Secretary of Defense (Comptroller), the Special Assistant to the Director of the Bureau of the Budget, and the Service Deputy Chiefs of Staff for Personnel.

was to suffer any net reduction in total pay as a result of the study's recommendations.

- The study was to concentrate on the principles and concepts of military compensation rather than try to justify a military pay raise.

Headed by Rear Admiral L. E. Hubbell, USN, an Interservice Task Force, supplemented and augmented by consultants and advisors from other government agencies, found that the military pay system is cumbersome, complex, confusing, inequitable and inefficient for the type of force that has developed since the Korean War.

Study Goals

The study had two specific goals. The first was to evaluate the existing military compensation system's effectiveness in attaining a two-part objective:

- To provide a fair and equitable relationship between military compensation and that of civilians with similar qualifications.
- To attract, retain and motivate to career service the kinds and num-

bers of people that our uniformed Services need.

The second goal was to develop specific recommendations on those changes needed to modernize the military pay system.

Begun in March 1966, the study entailed considerable research into military, government civilian, and private civilian pay structures. Fact finding included:

- Survey of civilian occupations held by 280,000 ready reservists with more than two years active duty.
- Collection of Bureau of Census data on earnings in 88 civilian occupations.
- Survey of occupations and earnings of 100,000 retirees.
- A 5-percent sample survey of active duty pay records to establish typical earnings based on length of service and dependency status.
- Comparison (by Budget Bureau and Civil Service Commission experts) of enlisted and officer grades with blue collar and white collar grades of civilian government employees by duties and responsibilities.
- Study of compensation principles, concepts and practices in military forces of other countries, other Federal salary systems, and the private sector of the economy.

The study revealed that a simple pay raise is not the answer, nor is tinkering with the already outmoded system. Military compensation has to be overhauled to bring it abreast of four significant changes in the composition of the forces.

Since the United States has assumed leadership of the free world, the country needs larger and different kinds of active military forces than when a small cadre of active forces was sufficient.

The military career pattern has changed. Operational units need larger numbers of younger, more vigorous personnel than did cadre forces of senior leaders and trainers. Formerly the military could offer a



Rear Admiral Lester E. Hubbell, USN, Dir., Compensation and Career Development Office of the Asst. Secretary of Defense (Manpower and Reserve Affairs).

reasonable prospect of a full career to retirement to all who entered the career force. Now the Services need personnel in three categories: those who serve only their minimum military obligation; those who voluntarily serve for some additional period but not to retirement; and those who voluntarily serve until retirement. The military pay system must be fair to members of all three groups.

The technological revolution that has swept through our society has impacted especially severely on the military. The weapons and equipment are vastly more complex than in past decades. The impact of these changes on military compensation is obvious, but no less important. Modern military pay must be aimed at new kinds of people with new ranges of opportunities, and must meet the competition from the civilian private sector.

Perhaps most important for pay purposes, the military is no longer so different from the rest of society that meaningful comparisons cannot be made between the two. In an earlier time, the military was rather sharply segregated from the civilian society. Now the military is much more a part of society. Large manpower needs of modern forces has created millions of veterans. Public interest and discussion of military matters has kept the military aware of and responsive to public reaction. Sheer size has caused much of the military population to spill over into civilian communities. Military people compare their pay with their civilian neighbors, and shop in the same markets.

Two Parts of the Force

Early in the study it became apparent that there are two distinct groups in the military forces, non-careerist and careerists, for whom pay principles and concepts must be evaluated separately.

The vast majority of non-careerists are young, single citizen-soldiers fulfilling a military obligation. Their average age is 20 years; 84 percent have no dependents; only 2 percent have 3 or more dependents. Training in a technical skill, useful later in the civilian economy, is a major inducement to enlistment. More than 80 percent will return to civilian life at the end of their first tour; less than 10 percent will retire from service.

Economy and military necessity require that these young, non-career enlisted men be housed, fed, clothed, and provided medical care, dental care, and other essential services, in kind, on government facilities. While the draft insures adequate numbers of non-career personnel, society incurs the obligation to compensate them fairly and equitably with their civilian counterparts who do not serve.

The study revealed that the average non-careerists earn residual income comparable to that of their average civilian cohorts during their four years of obligated service. Table 1 summarizes the residual income of non-careerists and civilian high school graduates.

No significant changes were recommended for compensation of non-career enlisted men. They would continue to live on military installations, eat in government dining halls,

and receive "personal money pay" in cash.

Overhaul Career Force Pay Structure

In the part of the force structure inhabited by careerists, the study group found the greatest need for pay overhaul.

Under the present system of pay and allowances, there are over 26 separate elements of compensation:

- Salary elements: basic pay; quarters and subsistence allowance, which are paid tax-free when quarters and subsistence are not furnished in kind; and the tax advantage of tax-free allowances.

- Special and incentive pays: incentive pays for hazardous duty; reenlistment bonuses; professional, responsibility and proficiency pays; and separation pay.

- Supplemental benefits: provisions for retirement accruals; dependents indemnity and compensation; death gratuities; social security; medical care; commissary and exchange savings; FHA mortgage insurance premiums; and unemployment compensation.

- Noncompensation personnel costs: clothing issues and allowances; family separation allowance; dislocation allowance; overseas station allowance; burial costs; and extra hazard on service life insurance.

A key problem found in the career force was a deficit in the numbers of persons in the middle experience range—four to 14 years of service. This deficit of personnel in the mid-range of experience levels has existed for many years, despite increases in basic pay and other compensation elements costing \$3.5 billion since 1962. Because of this chronic shortage, the Defense Department has been forced to use inadequately experienced personnel simply because they were the only ones available.

Compensation was found to be a major cause of the problem.

Recent increases in salaries for Federal civilian employees have already attracted better qualified people, thereby providing a wider base from which to select personnel. It is clear that the uniformed Services must take similar measures.

Military personnel lack confidence in the system because it is complex and confusing, it does not reward men equitably, and it cannot be com-

Comparison Non-Career Enlisted With High School Graduate Cohort Income

Years of Service	Age	Residual Income	
		Military	Civilian High School Graduate
1	19	\$1,202	\$1,198
2	20	1,522	1,296
3	21	1,985	1,393
4	22	2,408	1,471
Cumulative		\$7,112	\$5,358

Table 1.

pared and adjusted objectively to related to trends in civilian earnings.

Consequently many members leave military service for supposedly higher paying civilian jobs. However, they often find they have less disposable income than in service because they undervalued payments in kind (housing and subsistence) or the advantages of untaxed allowances, and savings provided through the commissaries, exchanges and medical facilities.

The multitude of pays, allowances, tax advantages, savings and compensations in kind is so confusing that 99 percent of military personnel don't know how to compute their value, much less compare it with the salaries of their civil service or other civilian cohorts. A Louis Harris poll conducted for the Navy revealed military personnel underestimate the value of their earnings by 10 to 24 percent. Banks and finance companies in the Washington, D.C., area underestimated actual salaries by as much as 50 percent. One lender stated the situation: "If the man doesn't get it in cash, the I don't even stand a chance of getting my hands on it, and it's not income as far as I'm concerned."

The portion of pay that is tax-free allowances or tax-free compensation in kind rewards men according to their income tax deductions, or their family size, rather than according to their rank or job. Furthermore, the allowances for quarters and subsistence (food) have not been adjusted to keep pace with actual costs.

Under the present pay scheme, imputed retirement contribution is considered part of total salary, but only a minority of the personnel (46 percent of career enlisted men and 18 percent of officers) retire and realize the benefit. Presently military retirement is not vested with the individual. This feature discourages mid-length careers and contributes to the imbalance of the forces. About the eighth year of service the retirement incentive begins to take hold and, because of lack of vestment, locks people in careers at least until retirement at 20 years.

Comparability with Civilian Earnings

In his April 1967 pay message to Congress, President Johnson stated

that military pay should be comparable to government civilian pay. The across-the-board pay raises of 1966 and 1967 were based on this comparability of civilian pay principle.

One question before the pay study group was: Are members of the uniformed Services now paid at parity with their civil service counterparts? Two separate studies answered a clear-cut "no." It was obvious that military pay must catch

up with federal government civilian wages.

The task group studied the military and civilian occupations of 280,000 reservists and Bureau of Census data on earnings of civilians of similar occupations. From this data an average salary was derived for each enlisted and officer grade (E-4 through O-8) to match the average earnings of civilian cohorts. Adjusted for the still existent lag of civil service salaries behind private sector

Military Career Force Lag Behind Cohort Parity

Pay Grade	Average Salary Required for Parity with Cohort	Adjusted Average 1 October 1967 Military Salary (1)	Difference		Amount of Lag (\$ Million)
			\$	%	
0-10	\$40,138	\$35,614	\$ 4,524	11.3%	\$ 0.2
0-9	34,602	31,070	3,532	10.2	0.4
0-8	29,324	27,151	2,173	7.4	1.1
0-7	28,559	23,562	4,997	17.5	3.3
0-6	24,287	19,724	4,563	18.8	78.3
0-5	19,759	16,670	3,089	15.6	127.4
0-4	15,201	13,736	1,465	9.6	101.7
0-3	11,188	11,403	— 215	— 1.9	—23.3
0-2	8,353	8,852	— 499	— 6.0	—29.4
0-1	7,700	6,615	1,085	14.1	78.1
Comm Off	\$12,435	\$11,528	\$ 907	7.3%	\$ 397.3
W-4	\$15,473	\$12,904	\$ 2,569	16.6%	\$ 10.8
W-3	11,836	10,887	949	8.0	3.3
W-2	10,151	9,310	841	8.3	6.2
W-1	8,459	8,217	242	2.9	2.4
Warr Off	\$10,595	\$ 9,694	\$ 901	8.5%	\$ 22.7
All Off	\$12,319	\$11,412	\$ 907	7.4%	\$ 360.0
E-9	\$12,050	\$10,633	\$ 1,417	11.8%	\$ 23.2
E-8	9,670	9,301	369	3.8	15.7
E-7	8,112	8,191	— 79	— 1.0	—11.4
E-6	7,271	7,134	137	1.9	33.5
E-5	6,552	5,918	634	9.7	318.1
E-4	5,830	5,128	707	12.1	181.0
Career EM	\$ 6,927	\$ 6,472	\$ 455	6.6%	\$ 565.1
TOTAL				6.9%	\$ 925.1

(1) Adjusted to reflect imputed retirement credit of 6.5 percent of military salary.

Table 2.

civilians, military pay trailed civilian parity pay by 6.9 percent. Table 2 compares military payline salaries with salaries of their civilian cohorts in private enterprise.

Budget Bureau and Civil Service Commission experts, in an independent study, analyzed job descriptions and specialties, and linked these with appropriate civil service grades. Through a standardized and systematic evaluation of a large number of jobs in both the military and civil

service systems, the personnel specialists found corresponding work requirements and levels of responsibility. They found comparability between O-8 (major general) and GS-18, between O-1 (second lieutenant/ensign) and GS-7, and between E-3 corporal/airman first class/seaman) and GS-3 for white collar jobs and Wage Board 5 for that E-8 and O-2 should be paid the same salaries.

Establishing this linkage between

civilian and military jobs enabled the Budget Bureau-Civil Service Military pay team to fit a military "payline" to corresponding civilian grades. The payline is that longevity step that best represents each grade. It is the pivotal salary step for each grade. Actual salaries within each grade would range above and below the payline according to longevity. Based on payline derived from this study, they found military salaries lagged civilian pay by 6.2 percent. Table 3 shows payline salaries as of October 1967, and the adjustments required to bring the military payline into full comparability with government civilian pay.

Task Group Recommends Cash Salary

These findings lead to the recommendation that the same salary should be paid to all career personnel of the same grade and years of service, without regard to dependency status or quarters occupancy status. Longevity increases within each grade would be retained. However, promotion to the next higher grade would be more lucrative than increases due to longevity.

Retirement contribution should be vested to the service member and refunded upon termination of service short of retirement. When a member transfers to a reserve component, he retains his potential eligibility for military retirement. Therefore his retirement contribution would not be refundable at the time he separates from active duty. It would be refunded when his potential retirement eligibility ended.

Under the full salary recommendations, career military personnel would no longer receive allowances or payments in kind. Those living on military installations would pay fair rental values for their quarters, exchanges and commissaries would operate on a self-supporting basis, and each person would contribute his share toward a vested retirement annuity.

Some special or incentive pays are fixed amounts; others vary with basic pay and allowances. The task force recommended that fixed special pays remain at present levels, and that

Military Career Force Lag Behind Civil Service 1 October 1967 Salaries

Pay Grade	Average Salary Required for Parity with Civil Service	Adjusted Average 1 October 1967 Military Salary (1)	Difference		Total FY 1968 Amount of Lag (\$ Million)
			\$	%	
O-10	\$83,791	\$85,614	\$-1,823	- 5.4%	\$- 0.1
O-9	30,144	31,070	- 926	- 3.1	- 0.1
O-8	27,055	27,151	- 96	- 0.4	- 0.1
O-7	25,856	28,562	1,794	7.1	1.2
O-6	22,387	19,724	2,663	11.9	45.7
O-5	18,709	16,670	2,039	10.9	84.1
O-4	14,858	13,736	1,122	7.6	77.9
O-3	11,737	11,403	334	2.8	37.0
O-2	9,327	8,852	475	5.1	28.0
O-1	7,548	6,615	933	12.4	67.2
Comm Off	\$12,444	\$11,528	\$ 916	7.4%	\$ 340.8
W-4	\$15,126	\$12,904	\$ 2,222	14.7%	\$ 9.3
W-3	12,431	10,887	1,544	12.4	5.4
W-2	10,029	9,310	719	7.2	5.3
W-1	8,406	8,217	189	2.2	1.9
Warr Off	\$10,568	\$ 9,694	\$ 874	8.3%	\$ 21.9
All Off	\$12,325	\$11,412	\$ 913	7.4%	\$ 362.7
E-9	\$11,330	\$10,683	\$ 697	6.2%	\$ 11.4
E-8	9,432	9,301	131	1.4	5.6
E-7	8,219	8,191	28	0.3	4.1
E-6	7,242	7,134	108	1.5	30.4
E-5	6,356	5,918	438	6.9	220.3
E-4	5,865	5,123	742	12.7	189.8
Career EM	\$ 6,843	\$ 6,472	\$ 371	5.4%	\$ 461.6
TOTAL				6.2%	\$ 824.3

(1) Adjusted to reflect imputed retirement credit of 6.5 percent of military salary.

Table 3.

(Continued on page 20)

Navy Plans and Mans for ILS

Rear Admiral N. Sonenshein, USN

The Navy is seeking to provide a firm management foundation for an aggressive program to improve support planning by applying the principles of integrated logistic support (ILS). We are now moving rapidly toward conversion of policy and principles into that which is of prime interest to industry, namely, the hard reality of contract specifications. This article will endeavor to fix our present position in relation to the "how" and "when" of this hard reality.

Although the Navy had made considerable progress in the practical application of ILS before DOD Directive 4100.35, "Development of Integrated Logistic Support for Systems and Equipments," was issued, this directive was a major rallying point for Navy personnel already aware of the potential in ILS. It served as an impetus for accelerated progress. Rather than present a chronological discourse of this progress, I will discuss the Navy's approach to ILS by a look at the past and future within each of the following aspects of the total picture:

- Organization.
- Personnel.
- Scope of applicability.
- Policy and procedures.
- Specifications.
- Test and demonstration.

Organization

Although procedural changes are frequently the first steps toward the implementation of many new concepts, ILS faced an earlier hurdle. ILS is not compatible with the conventional logistic function-oriented organization, and this incompatibility must be resolved before effective implementing action can be taken.

This hurdle, of course, can exist in industry as easily as in Government.

We soon discovered that our own staff was the first to require reorientation. Specifically, review of the organization at the Headquarters, Naval Material Command (NAV-MAT), to identify the office with responsibility over the total functional area of weapon system support planning, revealed a startling fact. While the Navy had long recognized that design decisions create logistic requirements and that weapon system support decisions pertaining to any one element of logistic support must, of necessity, affect the others, the organizational structure of the NAV-

MAT headquarters did not reflect that recognition. The staff had specialists in spare parts, technical manuals, and the other elements of logistic support, but clear-cut responsibility was not fixed for the critical area of support for an entire weapon system.

This organizational deficiency was overcome on Oct. 1, 1967, with the creation of the Integrated Logistic Support Division under the Deputy Chief of Naval Material for Logistic Support. Almost all of the personnel for this division were obtained by reassignment from other parts of the headquarters staff. The chart shown in Figure 1 indicates the organization of the new division, and its position in the Headquarters, Naval Material Command.

The balance of the initial organizational aspects revolved around:

- An educational effort to make all directorates in each Systems Command aware of the impact of a continuously integrated approach to logistic support.
- Establishment of an ILS office in each Systems Command headquarters to provide top level management of ILS planning.
- Decision as to where to place the "logisticians" required by DOD Directive 4100.35.

Top level ILS management was provided in each Navy Systems Command. However, where the individual logisticians are to be sited and how many formally designated logisticians there ought to be has not yet been finally determined. Because organizational placement is critical to the question of career pattern, it should follow a compatible standard pattern throughout the Systems Commands.



Rear Admiral N. Sonenshein, USN, is Deputy Chief of Naval Material (Logistic Support) with responsibility for implementation of integrated logistic support in the Navy. He has held many responsible positions in acquisition management and fleet support, including project manager for the Fast Deployment Logistics Ships Project, and Assistant Chief, Bureau of Ships for Design, Shipbuilding and Fleet Maintenance.

Personnel

In my view, the really important ILS challenge lies in the area of personnel—not in terms of numbers of logisticians, but in terms of motivation, education, organizational position, and career pattern.

In spite of the use of the term "life cycle support management," ILS has major application to the early acquisition phases, with the majority of the effort being expended in concept formulation, contract definition, and development. It is in this theatre that the logistician will perform, with the size of the stage and the significance and complexity of the script dictating the need for an accomplished performer. The intensity of the ever-present lighting on this stage will soon reveal whether he is up to the task.

What, then, is a logistician, or as we in the Navy have identified him, an acquisition logistician? In the functional sense, he has the responsibility for carrying out ILS planning for a weapon system. To do so, he must understand the process by which we acquire the weapon system. He must know what logistic considerations are pertinent in concept formulation, contract definition, development, and production. In turn, this demands a sound knowledge of the realities of operational logistic support in the Fleet, and intimate ac-

quaintance with the methods used by each logistic element manager (including the Defense Supply Agency and element managers of other Services) to acquire and manage their particular elements.

Rather than having only an administrative background, engineering and technical orientation is required. The logistician should be able to project in quantified terms the effects of alternative logistic system and design proposals on operational support, and to use those projections to influence concept formulation, contract definition, and development decisions. It is important that he have the training, experience, stature and ability to warrant his complete acceptance by project management and development personnel as a valued member of their team.

How to acquire and retain these logisticians is the subject of discussion at the headquarters level of the Naval Material Command and the Systems Commands. In all of these discussions, one factor is accepted as paramount: A clearly defined career pattern for logisticians is essential.

Obviously, providing this career pattern will require a long-term effort. Rather than wait for an ideal solution, we are endeavoring to provide working-level training in the practical application of ILS in weapon system acquisitions. This training is being provided by an in-

tensive one-week ILS course being conducted at the Navy Logistics System School. By the end of 1968, approximately 700 military and civilian personnel will have attended this course. The course not only trains prospective acquisition logisticians, but makes various functional experts aware of the impact of ILS on the total acquisition process.

The future will bring extensive efforts not only to add more people for logistic planning functions, but more importantly to build within our present resources a cadre of trained, highly motivated acquisition logisticians who are proud to be members of a challenging and respected professional group.

Scope of Applicability

Although ILS is generally related to major weapon system and equipment acquisitions, the Navy regards the principles of ILS as valid regardless of the size of the acquisition, and intends ultimately to utilize them as appropriate in all system and equipment acquisitions. However, we view ILS implementation as an evolutionary process that will take from five to eight years to complete down to the level of the smaller acquisitions.

Here again the Navy has a long-term ideal, but we are trying to act decisively with practical short-term efforts which are intended to produce rapid and visible ILS planning, as well as leading us toward our ultimate goal.

We in the Navy must communicate with industry in terms of contract specifications. Industry will soon begin to see this communication. The next 24 months will see a major increase in the number of Navy contracts with stated ILS requirements. Since July 1966, we have placed specific requirements for ILS in early planning documents (such as Technical Development Plans) for over 400 acquisitions, covering a broad range of equipment types. As these acquisitions progress through the contract stage, industry will be faced with the need to respond to specified ILS requirements.

Policy and Procedures

The Navy has handled ILS policy and procedures in two formal directives: SECNAV Instruction 4000.29,

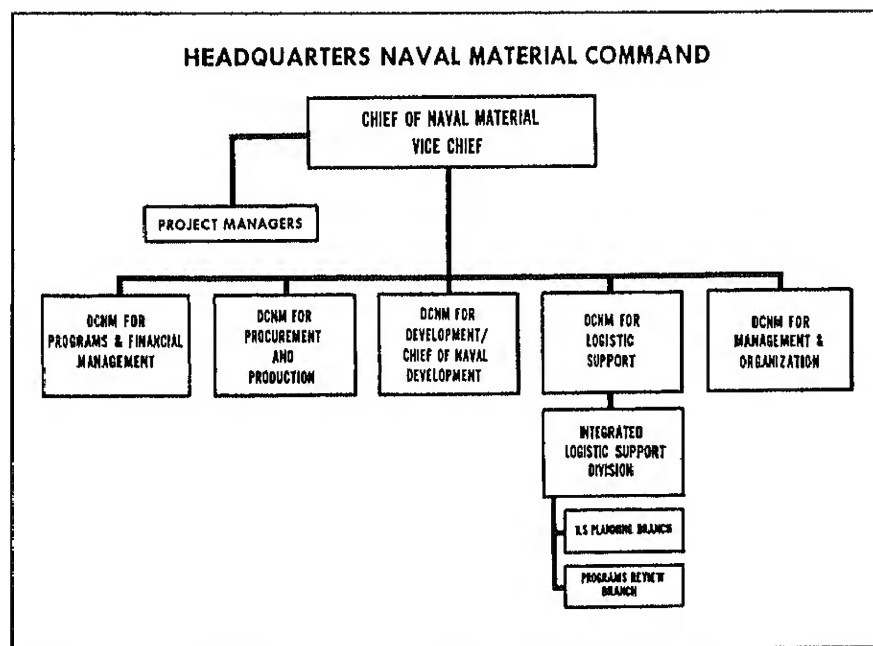


Figure 1

which establishes Navy Policy in line with DOD Directive 4100.35; and NAVMAT Instruction 4000.20, which governs logistic support planning actions commencing with concept formulation, and establishes certain minimal requirements relative to the organization of the project or unit responsible for the acquisition. The latter directive also describes the support planning activity which must be accomplished during each phase of the acquisition.

Little need is foreseen for major changes to the ILS policy. However, as we gain experience in actual application, the procedures of NAVMAT Instruction 4000.20 will undoubtedly need revision.

Specifications

The most formidable immediate obstacle in fully embracing ILS relates to contract specifications. No one really disputes that ILS holds forth an intuitively valid promise of improve fleet support. However, it is obvious that without good workable specifications, ILS will never achieve its potential.

Fortunately, the Navy has had prior experience with one broad ILS specifications, known as WR-30, which has been successfully applied in a number of aircraft acquisitions. This specification is now being revised, and others are being developed by the Systems Commands to fit the specific needs of varied types of acquisitions. Our staff in the Naval Material Command is charged with the responsibility for reviewing and

approving these specifications. We will, of course, solicit review and comment from industry.

The large number of acquisitions, which will move forward with ILS requirements during the next two years, will quickly reveal how well we have done the job of expressing the contribution expected from industry. As soon as the limits of any specification deficiencies are defined by negotiations, we will mount an all-out effort to resolve the problem. At present, we see a period of approximately three years before the major specifications can be firmed up and proven.

Test and Demonstration

Following specification development and personnel considerations in our priority list is the perfection of test and demonstration methods which will measure, prior to introduction in the Fleet, the adequacy of the logistic support package to be furnished with each new weapon system. Such tests are now required for each acquisition, and we expect to place more emphasis on this area in the future.

The Navy is committed to integrated logistic support for every weapon system and equipment we acquire. We have come a long way in the last two years, mostly with internal developments. Now we are becoming progressively more involved in Navy/industry ILS dialogues, and we have every expectation that such exchanges will prove fruitful in establishing integrated logistic support as a way of life in weapon system acquisition and life-cycle management.

Foundations for the Future

(Continued from Page 5)

for today and tomorrow tend to be costly and complex—in many instances, more costly and complex than the systems they produce. An example is the space suit. To test a comparatively inexpensive space suit, we must have environmental chamber capable of simulating the conditions encountered in space.

This is perhaps one of the penalties of our technological success. But maybe we should quit looking at facilities as "penalties" and view them as "opportunities"—as the springboard to new generations of progress.

In any event, we cannot evade or avoid, in the years just ahead, the challenges of exploding progress in compressed periods of time. Lead times will become still shorter; the time for preparedness ever briefer.

Early, productive planning for the design, construction and use of aerospace test facilities will help offset these shrinking lead times. The converse, of course, is also true.

National technical resources of the stature of today's ranges, wind tunnels, and environmental chambers do not come easily or automatically. We must keep their potentials always before us. Otherwise, in this age of technological plenty, we may find ourselves suffering from an "Achilles heel," with the ideas, the technologies, and the needs clearly apparent but without the means to prove or disprove our technical theories.

In AFSC we have reaffirmed during the past year the competence of the government-industry partnership team to respond to the needs of our combat forces in Southeast Asia, to respond to the continuing challenge of maintaining a credible strategic deterrent, and to be responsive to the requirements for sound management practices in these days of limited resources.

Now we must also pledge our joint support to the growth of those national facilities which represent our foundations for the future. Nothing less than our national technical competence depends on the decisions and the developments to be made in these directions in the next several years.

Preparedness is our mutual concern. It must also be our common mission.

Report on Defense-Related Statistics Available

This issue of the *Defense Industry Bulletin* will be the last to carry the report Selected Defense Department Economic Indicators (appearing on page 37 in this issue). The data will be included in a new, more comprehensive report, *Defense Indicators*, compiled by the Bureau of the Census. Data will be furnished by the Defense Department, Bureau of Labor Statistics, Bureau of the Census, the Treasury Department, and the Office of Business Economics.

Approximately 30 time series are included in the new report, grouped

according to the time at which the activities which they measure occur in the defense order-production-delivery process.

A complimentary copy of the *Defense Indicators* is available from the Chief, Statistical Analysis Division, Bureau of the Census, Washington, D.C. 20233.

Defense Indicators is available by subscription for \$4.50 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.



MEETINGS AND SYMPOSIA

AUGUST

Physiological Basis for Human Work Performance Symposium, Aug. 24, at Boston University. Sponsors: Army Research Institute of Environmental Medicine, Boston University and the American College of Sports Medicine. Contact: Dr. Ralph F. Goldman, Dir., Military Ergonomics Laboratory, Army Research Institute of Environmental Medicine, Natick, Mass. 01760.

Physiological Sciences Twenty-Fourth International Congress, Aug. 25-30, in Washington, D. C. Sponsor: Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5041.

Fifth International Congress on Photobiology, Aug. 26-31, at Dartmouth College, Hanover, N. H. Sponsor: Air Force Office of Aerospace Research. Contact: Dr. R. B. Stevens, National Research Council, 2101 Constitution Ave., N.W., Washington, D. C. 20428. Phone (202) 961-1200.

SEPTEMBER

Fifteenth Technical Meeting of the AGARD Avionics Panel on Techniques for Data Handling in Tactical Systems, (dates undetermined), at Amsterdam, Netherlands. Co-sponsors: AGARD and NATO. Contact: Dr. Irving J. Gabelman, Program Chairman, Advanced Studies Group, Rome Air Development Center (EMD), Griffiss AFB, N. Y. 13440, Phone (315) 330-7208.

International Conference on Temperature and Cold, Sept. 2-6, at Aspen, Colo. Sponsor: Air Force Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5041.

International Conference on Light Scattering in Solids, Sept. 3-6, at New York University. Sponsor: Army Research Office—Durham. Contact: Dr. Charles Boghosian, Physics Div.,

Army Research Office—Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285, Ext. 34.

Third Annual Convention of the Society of Logistics Engineers, Sept. 5-6, at the Ambassador Hotel, Los Angeles, Calif. Sponsor: Society of Logistics Engineers. Contact: G. F. Fairhurst, Convention Chairman, Society of Logistics Engineers, P.O. Box 14778, Long Beach, Calif. 90814.

Solid Mechanics Symposium, Sept. 10-11, at Baltimore, Md. Sponsor: Materials Advisory Group of the Army Materiel Command. Contact: Joseph L. Bluhm, Technical Working Group on Materials, Army Materials and Mechanics Research Center, Watertown, Mass. 02173, Phone (617) 926-1900.

Tenth Annual Meeting of the Military Testing Association, Sept. 18-20, at San Antonio, Tex. Co-Sponsors: Military Testing Association and Aerospace Medical Div., Personnel Research Laboratory. Contact: Mr. Fotis, Aerospace Medical Div., Personnel Research Laboratory, Lackland AFB, Tex. 78236, Phone (512) 674-3211, Ext. 3984.

Advanced Planning Briefing for Industry on Naval Ordnance/Missiles, Sept. 18-19, at Coronado, Calif. (Classified Secret.) Co-Sponsors: Naval Material Command and the American Ordnance Association. Contact: Cdr. A. D. Sullivan, USN (Ret.), American Ordnance Association, 17th & H Streets, N.W., Washington, D. C. 20006, Phone (202) 347-7250.

Aerodynamic Deceleration Systems Conference, Sept. 23-25, at El Centro, Calif. Co-Sponsors: Defense Department Joint Parachute Test Facility and the American Institute of Aeronautics and Astronautics. Contact: Earl C. Myers, 6511th Test Group Parachute, Naval Air Facility, El Centro, Calif. 92243, Phone (714) 352-6642.

OCTOBER

Government Microcircuit Applications Conference, Oct. 1-3, in Washington, D. C. (Classified Secret). Sponsors: Defense Department, NASA,

Department of Commerce, National Bureau of Standards, Post Office Department and other government agencies. Contact: Mr. A. E. Cook, Office of Naval Research, Code 403C, Washington, D. C. 20360.

Twelfth Annual Organic Chemistry Conference, Oct. 8-9, at Natick, Mass. Co-sponsors: Army Natick Laboratories and NAS-NRC Advisory Board on Military Personnel Supplies. Contact: Dr. L. Long Jr., Head, Organic Chemistry Group, PRL, U.S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000, Ext. 2414.

Eighth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Oct. 8-10, at the Holiday Inn, Bordentown, N. J. Sponsor: Naval Air Propulsion Test Center. Contact: Mr. J. L. Paleza, Naval Air Propulsion Test Center, P.O. Box 176, Trenton, N. J., 08601 Phone (609) 882-1414, Ext. 317.

Matrix Methods in Structural Mechanics Conference, Oct. 15-17, at Wright-Patterson AFB, Ohio. Co-sponsors: Air Force Flight Dynamics Laboratory and the Air Force Institute of Technology. Contact: Mr. Berke, Air Force Flight Dynamics Laboratory, (FDTR), Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55651.

Silicon Carbide Second International Meeting, Oct. 21-23, at Pennsylvania State University. Sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and the Carborundum Co. Contact: Mr. C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 2284.

Explosive Chemical Reactions Seminar, Oct. 21-23 at Durham, N.C. Sponsors: Army Research Office, Air Force Systems Command and the Naval Ordnance Laboratory. Contact: James Norman, Dir., Research-Technology Div., Army Research Office, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285, Ext. 22 or 44.

Prime Contracting Program of Small Business Administration

Clyde Bothmer

[Editor's Note: This is the second in a series of articles about defense contracting for small business by Clyde Bothmer, Deputy Associate Administrator of the Small Business Administration.]

In recent years the increase in the technological complexity of material procured by the Defense Department, and the procurement policy of acquiring systems from a single contractor responsible for a total package, have combined to place many proposed acquisitions beyond the capabilities of small businesses. There are, however, many instances where small firms interested in becoming government prime contractors can perform the services desired by the Government. The Small Business Administration (SBA) takes active interest in assisting small businessmen to increase the number of contracts available to small business.

Three principle efforts contribute to the aid which SBA offers in the prime contracting field: the "set-aside," the "break-out," and the Certificate of Competency.

The set-aside effort is the specific identification of certain required material or services to be provided only by firms which qualify as small businesses. Some form of this approach has been utilized since the establishment of the Small Business Administration. Prior to July 1966, SBA representatives participated actively with the Defense Department personnel in reviewing acquisitions for possible set-asides. At that time, SBA shifted from active participation to the policy of surveillance. SBA personnel reviewed overall procurement policy and figures regarding

set-asides, but were not involved in individual cases.

Unfortunately, the use of surveillance alone did not prove adequate to the needs of the SBA mission. Inquiry by the cognizant Congressional committees resulted in a study to determine whether the joint nature of the set-aside program should be reinstated. A steering committee, including representatives from the Defense Department, the National Aeronautics and Space Administration, the Bureau of the Budget, and the Small Business Administration, was established in September 1966 to conduct the study.

On February 21, 1967, the steering committee recommended to the Director of the Bureau of the Budget and the Administrator of the Small Business Administration that SBA develop, in cooperation with various procurement agencies, a set-aside program which would incorporate the best features of the unilateral (procurement agencies responsible for initiation of all set-asides), joint (procurement agencies and SBA sharing the responsibility for initiation of all set-asides), and surveillance procedures.

The recommendation also stated that a new approach should provide for the performance of the following functions by SBA:

- Exercise the set-aside function only on those procurements not unilaterally set aside by the procuring agency.
- Appeal to the Secretary or head of the procuring agency in cases where agency representatives do not concur in a set-aside suggested by SBA.
- Make periodic surveillance reviews of procuring activities.

- Provide for set-aside reporting under a unified system not differentiating between unilateral and joint set-asides.

- Perform additional functions such as recommending "break-outs," locating additional small business suppliers, and recommending modification of unduly restrictive specifications.

Lack of personnel prevented full implementation of these recommendations immediately. However, SBA did begin active participation with Defense Department personnel in the set-aside program, utilizing those individuals previously committed to the surveillance effort, and began planning for the necessary additional staffing to properly carry out the recommendations.

It is intended that the primary responsibility will fall upon approximately 42 Procurement Center Representatives assigned to various Defense Department installations throughout the United States. The installations to which they will be assigned have been chosen for the greatest possible impact on small business contracting. Factors considered in the selection were: dollar amounts of installation procurements, type of item services purchased, and estimated potential for small business.

The individuals filling these positions as SBA representatives will have extensive and varied responsibilities. Their basic function is to find ways to increase the amount of business which small firms may do with government agencies. In order to fulfill this obligation, they must respond to a variety of demands upon their time. To maintain the set-aside program, the representative must review procurement actions which have not

been set aside by the agency unilaterally and make recommendations for joint set-asides. He must screen abstracts of bids, proposals and award data to determine if the maximum set-aside is being attained, and make appropriate recommendations to the procuring agency. In support of other SBA purposes, he must also try to discover small business bidders for procurements with inadequate small business competition, as well as keeping close watch on the Certificate of Competency program to ensure its application, when appropriate. Further, as SBA's "man-on-the-spot," the Procurement Center Representative is expected to evaluate the procurement operations and procedures of the installation in order to determine the effect on small business, and to maintain an awareness of procurement plans of the agency and recommend changes which will be helpful to small business. While the job is demanding, the burden is not so great as it may initially appear, *i.e.*, impossible. The representative is supported by the resources of the Regional and Area SBA Offices, as well as the efforts of the Central Office in Washington, D.C., and he maintains contact with those offices.

There are two collateral duties which are important to the prime contracting program. Specifically, the representative is expected to counsel small businesses on request, at least to the point of ensuring that appropriate aid is provided by the Regional Office. He is also expected to call SBA's attention to small businesses which are in danger of default on a contract, so that help may be offered in time to prevent that occurrence.

The latter point is of increasing interest to SBA, since the award of a set-aside to a small businessman is of negative value if the contract is not fulfilled; both the Government and the businessman are losers. Although this is not a critical problem in terms of frequency of occurrence, the nature of the issue makes it significant. Therefore, SBA intends to assign representatives to some Defense Contract Administration Services Regional Offices. These individuals will provide advice to small businessmen on matters of performance, inspection and acceptance of material, accounting for government property, security clearance of facilities, re-

porting and payments. The representatives will be increasingly valuable in locating firms which are experiencing difficulty in fulfilling contracts. It is also planned that they will participate in a study to determine principal contract administration problems faced by small business. Later, this study will serve as a basis for SBA recommendations of changes in policy and procedure, which will make this aspect of government contracting less burdensome on small concerns.

The second factor in SBA's contract assistance efforts is the utilization of so-called "break-out" which is a continual function for personnel in procuring agencies and the Small Business Administration. This slang expression has three connotations. First, the term may mean separation of specific services or material from a more general contract, *e.g.*, janitorial services might be broken-out of a general contract for housekeeping services on a missile installation. The second interpretation of break-out is the reduction of a single large procurement to several procurements in quantities which are within the capabilities of small businesses, *e.g.*, while the single procurement action for 1,000 small boats might be beyond capacity of small firms, the procurement might be broken-out into two lots of 300 and one lot of 400. The third type of break-out is separation of sub-systems or components from a system which is to be acquired, *e.g.*, the radar might be broken-out of an aircraft system. The contract for such equipment or components is awarded on a prime contract basis and material is then furnished to the total-system contractor as government-furnished equipment. This technique not only makes additional prime contracts available to small business but may also make possible government savings by eliminating payment of profit to both prime and subcontractors on items which will be subcontracted, and/or forcing prices down by the medium of increased competition.

A third phase of the SBA prime contracting assistance effort revolves around the Certificates of Competency Program (COC). If a contracting officer proposes to reject the bid of a small business firm which is a low bidder because he questions the

firm's ability to perform the contract on the grounds of capacity or credit, the case is referred to SBA. As required by the Armed Services Procurement Regulation (ASPR), SBA personnel then contact the company concerned to inform it of the impending decision, and to offer an opportunity to apply to SBA for a COC which, if granted, would require award of contract to the firm in accordance with the Small Business Act.

The COC Program is carried out by a specialized SBA field staff of individuals with technical engineering backgrounds in cooperation with financial specialists, also of the field organization. On receipt of a COC application, the contracting officer of the procuring agency is notified that the potential contractor has applied, and a team of financial and technical personnel is sent to the firm to survey its potential. Although SBA has access to the pre-award survey conducted by the Defense Department, which serves as the basis of the contracting officer's decision, a completely new survey is conducted, evaluating the financial and technical characteristics of the applicant in terms of the needs of the specific procurement in question. Credit ratings, past performance, management capabilities, management schedules, and the prospects for obtaining needed financial help or equipment are all considered.

If the financial position of the firm is weak, if critical equipment is absent, or if the management effort is inadequate, the regular assistance programs of SBA (loans, management counseling, assistance in locating equipment, etc.) may be applied to strengthen capability. If it appears that the firm has the credit and productive capacity required to fulfill the contract, with or without SBA assistance, the team's findings will be presented to a COC Review Committee in the appropriate Area Office. The committee, composed of legal, technical and financial representatives, under the chairmanship of the Area Coordinator for Procurement and Management Assistance, makes its recommendation to the chairman after a detailed review of the case. The chairman, in turn, makes his recommendation to the Area Administrator.

If the decision here is negative,

the COC is denied and both the firm and the procuring activity are notified. If the decision is affirmative and the procurement is less than \$250,000, the Area Administrator issues a COC. For procurements in excess of that amount, the recommendation and supporting data are forwarded to Washington, D. C., where the Central Office COC Review Committee, also composed of legal, technical, and financial representatives, considers the case and makes a recommendation to the Associate Administrator for Procurement and Management Assistance. If the Associate Administrator's decision is negative, the firm and the procuring activity are so informed; if affirmative, a letter, certifying the competency of the firm as to the capacity and credit to perform the subject contract (the Certificate of Competency), is sent to the procuring activity. By terms of the Small Business Act and ASPR 1-705.4, the COC is conclusive on questions of capacity and credit, and the contract is awarded.

Frequently the process described in the foregoing is terminated before completion, because SBA makes new information available to the contracting officer which persuades him to reverse his decision and award the contract without a COC.

After a COC is awarded and the contract is let to the applicant, SBA keeps a close watch on progress. Monthly checks are made by SBA field personnel who report directly to the Central Office on the status of the contract. In this way SBA assistance is constantly available to the contractor.

A COC is valid only for the specific contract for which it is issued. A business concern which is capable of handling one contract may not be qualified to handle another. Each case is considered separately; and each case is considered only if and after the contracting officer has made a negative determination of capacity and credit. Firms may not apply before a determination on bid acceptance is made by the contracting officer, nor may firms apply which are disqualified for reasons other than capacity or credit.

If the procedures described herein seem circuitous, two facts should be borne in mind: a final decision must be reached by SBA within 15 working days of the original referral, and the potential damage to both the busi-

nessman and the Government is large. Granting a COC carelessly to an over-optimistic businessman could lead him into bankruptcy, delay important government procurements, and waste the taxpayers' money. By utilizing such care, however, the default ratio on COC awards compares favorably with those of procuring agencies on normally awarded contracts.

From 1954 through 1967, there were 1,947 contracts awarded on the basis of a COC, with a dollar value of \$369,290,000. The difference between the award prices of these contracts and the second lowest bid prices represents a savings to the Government of \$29,835,000.

In addition to the efforts which have been described, SBA carried on various projects directed to the same goals but requiring less manpower. For example, although dominance of procurement dollars by the Defense Department makes it necessary to concentrate manpower on DOD acquisitions, civilian agencies are not neglected. Civilian procurement centers are covered by SBA representatives and the liaison officer to civilian agencies is working with headquarters of some departments to set small business award and unilateral set-aside goals. Such procedures have been implemented at the Department of Commerce, and negotiations are proceeding with other agencies.

Another useful tool in helping small businesses to obtain government contracts is the "U.S. Government Purchasing and Sales Directory" which is compiled in the SBA Central Office, and will be available in revised version soon. SBA field offices also provide valuable assistance in the prime contracting program as a part of their routine management assistance efforts, *e.g.*, counseling on selling to the Government, and seeking out small firms which can offer competition on sole source or limited competition items.

While all of the effort described herein is directed toward maximizing the contract opportunities for small firms, it must be remembered that the business must still be obtained on a competitive basis. Competition on set-asides assures that the Government obtains fair value; and the COC Program is open only to low bidders. There are no give-aways to the ineffective or unproductive. SBA can help to open up opportunities but success in small business, as in large business, goes to those who earn it.

Hubbell Report

(Continued from page 18)

variable special pays be studied further.

Normal reenlistment bonus would be discontinued. Variable reenlistment bonus would be tied to the salary, rather than to base pay, as at present. Separation pay would also be tied to the annual salary.

Detailed recommendations on the military estate plan, retirement, insurance, social security, dependents indemnity and compensation will be made in the second part of the study, still to be finished and released.

Cost Effectiveness

The net cost to the Government of the recommendations would be \$460.4 million. This includes the increases in pay costs due to raising salaries to parity with Civil Service and the "save pay" policy that would prevent anyone from suffering a reduction in pay because of realignments within the structure. The total cost of the recommendations would be reduced by increased taxes, increased income from medical facilities, reduced operating costs of commissaries and exchanges, and elimination of reenlistment bonuses.

Greater visibility of income and increases to parity should increase retention and, thereby, reduce accession and training costs. The best estimates of training cost savings during the first year are \$160.2 million for enlisted men and \$29 million for officers.

Implementation of these proposals will at last allow members of the uniformed Services to compare their wages with those of their civilian cohorts. Military compensation would be brought in line with wages in other parts of the Federal Government and, through them, with the private sector.

In their letter transmitting the report to the Secretary of Defense, the members of the Military Compensation Policy Board said that the recommendations provide "... fairness and equity to the military individual, the Government, and the taxpayer; and should assist in attracting, retaining and motivating into the career force the kinds and numbers of personnel the uniformed services need."

DEFENSE PROCUREMENT CIRCULARS

Distribution of Defense Procurement Circulars is made automatically by the U. S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

Defense Procurement Circular No. 61, June 10, 1968. (1) Use of Government-Owned Industrial Plant Equipment by Contractors. (2) Procurement of Equipment under \$1,000 for Privately-Owned Contractor Plants. (3) Contractor Statement of Inability or Unwillingness To Provide Industrial Facilities. (4) Responsibility for Detection and Reporting of Overpricing.

GOVERNMENT PRINTING OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Guide to Contractor Performance Evaluation (Development and Production). Includes administrative procedures governing the preparation, processing and use of Contractor Performance Evaluation Reports. 50¢

Joint Packaging Manual (Vol. II). Provides uniform technical guidance to all of the military services and the Defense Supply Agency. 365 p. D7.6/8:4145.2 (Vol. II). \$2.

Procedures for Submission of Applications To Be Placed on Research and Development Bidders Mailing List (ASPR Supplement 4). 35¢

Army Procurement Procedure, Change 6. Contains changes in the Army Procurement Procedure. 1967. D101.6/4:965/ch. 6. 60¢

MILSTRIP, Military Standard Requisitioning and Issue Procedures, Change 17. Contains changes in MIL-

STRIP procedures 1967. D7.6/4:M 59/ch. 17. 60¢

Changes to MILSTRIP, Military Assistance Program Address Directory, Supplement No. 2, Sept. 1, 1967.

Change No. 2, Nov. 1967. D7.6/4:M59/supp. 2/rev./ch. 2. \$1.75

Change No. 3, Dec. 1967. D7.6/4:M59/supp. 2/rev./ch. 3. 20¢

Change No. 4, Jan. 1968. D7.6/4:M59/supp. 2/rev./ch. 4. 25¢

RESEARCH REPORTS

Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

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FROM THE SPEAKERS ROSTRUM

The Role of Universities in Government-Financed Research and Development

Address by Hon. Alexander H. Flax, Asst. Secretary of the Air Force (Research & Development), before the Federal Bar Assn., New York, N. Y., May 24, 1968

I am pleased to have this opportunity to discuss with you the roles of universities in connection with Government-financed research and development. This subject might have been called the role of government financing in university research and development, but, as you will learn my thesis is that the former subject is much broader than the latter. In order to achieve some degree of understanding of this subject, it is necessary to explore the character of university contributions to the advance of science and technology in this nation, and to put this into the perspective of what has been happening in our society and our economy.

We are now well along in what has been called the Scientific Revolution. Whereas the older Industrial Revolution had its origins mainly in the empirical development of the arts and crafts, the Scientific Revolution depends upon the organized and systematic pursuit of research and development. By systematic and organized pursuit of scientific research, I do not of course mean to imply that it is possible to schedule so-called "breakthroughs" in science and technology, although breakthrough is these days a much overworked word. However, I do mean that the overall rate of progress in given fields can, in major degree, be controlled by influencing the rate of allocation of material and human resources to given fields.

The universities play an important, and sometimes not fully appreciated, part in making our diverse national system of research and development institutions work. They do this by a variety of formal and informal mechanisms. Directly supported research

is the best known, and ranges from projects conducted by a single professor and his students to programs involving institutional support in a broad technical area, such as the tri-Service electronics research programs at several universities. Also a number of universities have assumed this responsibility for management of off-campus contract research centers of various kinds, including Federal Contract Research Centers. But these direct contributions, however important and necessary, constitute only a small part of the university role in the evolution and development of the national research and development program. The universities also contribute in a major way to the processes of communication and general education which make possible the smooth interaction of a diversity of institutions and organizations—government, industry, university and non-profit—which have together brought this country to its present position of leadership, not only in research and development, but in the utilization of technology. The universities are not only responsible for the output of highly competent scientists and engineers, schooled in the latest technical knowledge and techniques of a rapidly changing science and technology, who form the life blood of the research and development process, but the faculties, through their research publications and participation in government and in industry advisory boards and consulting activities, integrate, harmonize, and provide standards of quality for the research and development program of the nation as a whole.

It is often thought the universities should and largely do confine themselves to problems of basic research in pure science only. However, universities in this country also have the important mission of educating engineers—not just research engineers but men who will follow the pro-

fession in industry, government and private practice. Doctorates in engineering accounted for 20 percent of all doctorates in scientific fields and about 10 percent of all advanced degrees (masters and doctors) awarded by universities in 1966. The research interests of universities, therefore, range from the basic sciences on through to many problems in the field of application which lie on the frontiers of engineering. The latter class of problems often are of such a nature that, unlike many of the problems in research, the applications are apparent. In the DOD programming structure, these latter problems are categorized as exploratory and advanced development rather than as research. Therefore we find that universities are involved, not only in DOD research activities, but also in exploratory and advanced development. For example, in FY 1967, Air Force obligations for research in universities amounted to about \$37 million, whereas obligations for exploratory and advanced development were about \$58 million. Contracts in other research categories, including small amounts of effort funded under operational system development, brought the Air Force total for educational institutions in FY 1967 to \$96 million. In addition, about \$31 million were obligated for Federal Contract Research Centers administered by universities and colleges. For all Federal agencies, research and development at universities and colleges during FY 1967 totaled about \$1.4 billion, with an additional \$660 million for Federal Contract Research Centers administered by universities and colleges.

Most of the specialized attention within the Government to university research activities has been in relation to basic research programs, for which Federal obligation totaled over \$2 billion in FY 1967; about 50 percent of this amount went to universities. The growth in Federal support for such basic research activities over the past 10 years is dramatic to say the least. From 1956 to 1966 funds for this purpose in-

creased ten-fold. Contrary to what many believe, most of the growth in Federal support of basic research over the past 10 years has been in the programs of civil rather than military agencies. Paradoxically, whereas there has been some public airing of an alleged takeover of university research by the military, some of the research scientists have privately complained about what they describe to be a diminution of military interest and support of basic research. Many members of the scientific community have, thus, come to measure the government's interest in supporting research not on the basis of the level of effort, but on the rate of growth of this level. I am sure that it will not tax your mathematical powers to recall the laws of compound interest: this trend of growth in basic research funding, if it were to continue from the level of 1966 for 10 years, would result in a level of funding for basic research as large as the total national research and development budget today—some \$20 billion.

Priorities in Basic Research

The scientific community has for a long time had a very comfortable philosophy for the growth of research. This philosophy was premised on the belief that all basic research is intrinsically a good thing, that it should be limited only by the availability of qualified people, and that the nation should support all of its people capable of basic research in such projects as the expanding vistas of science and technology opened up to us. However, I do not think that 20 years ago anybody appreciated the degree to which the government policies in support of this philosophy would lead to the recent rates of growth. Such growth has come about not only because more and more people were attracted to basic research as budgets and opportunities expanded, but also because, as we seek to explore ever more difficult and obscure areas, the cost of equipment and technical support for research similarly expands. And as the financial requirements for research grow and the needs of various fields come into competition with one

another, we inevitably come to the question of how to establish priorities in basic research in our original various fields.

The question of assigning priorities in basic research in our original philosophy was presumed not to exist, but I submit that this was too naive a view of the world. The growth process in research is not self-regulating. The more research which is supported in a given area, the more graduate students will be trained and motivated in that area, thereby generating more promising research proposals in that area which, if considered sound, would inevitably be funded in accordance with our original philosophy and would, thereby, provide opportunities for the training of still more graduate students in that area. This process could, of course, go on *ad infinitum*. In the language of control engineering, the feedback loop is unstable. There are additional destabilizing feedback loops in the system. For example, the greater the funding of a given area, the greater the representation of influential scientists from that area on the government advisory groups recommending the allocation of research funds, and the more public attention and support the activities and accomplishments in that area are likely to draw. There is no doubt that corrective mechanisms can be and have been devised to stabilize the system, but the tendency to instability is always there to be reckoned with when the system is disturbed.

In this country, a substantial fraction of the basic research has been funded by mission-oriented agencies, such as the Defense Department,



Hon. Alexander H. Flax

National Aeronautics and Space Administration, the Atomic Energy Commission, the Department of Health, Education, and Welfare, etc. Each mission-oriented agency seeks to stimulate research in those areas deemed most likely to relate to its interests. Looking over the entire field of science, and assuring that no promising area of research is overlooked merely because the vision of the mission-oriented agencies may be too short, is the National Science Foundation. This situation has been the subject of considerable public debate and it has at times been argued that all basic research, and indeed a good bit of research beyond the basic, should be the responsibility of a Federal Department of Science. This proposal has not received a great deal of support from the scientific community, but it has a certain appeal in light of the philosophy of research for its own sake, and a recent desire on the part of some to isolate scientific research in the academic environment from the problems of the nation or, at least, to be highly selective about those national problems they will choose to work on.

Research Costs Spiral

The drive toward full utilization of our scientific potential on the frontiers of knowledge has had the inevitable effect of raising the cost of research. In the recent past, distinguished scientific committees and panels at the national level have pointed out the need to increase funding for research in fundamental particle physics, radio astronomy, optical astronomy, chemistry and oceanography, among other fields. In most of these cases, a large investment in research facilities, research instrumentation and equipment is implied. The cost of equipment seems to be on an ever increasing upward spiral, advancing much more rapidly than the cost of scientists actually engaged in research. This is contagious, moving from the fields at the frontiers of science to those somewhat in the rear; even research in the humanities now is coming to require a high speed digital computer in many cases.

The policies of DOD, with respect to basic research in universities, are

shaped by these considerations and the understanding which we have achieved of the conditions necessary to keep research in the academic environment healthy and productive. We do not attempt to direct basic research in the universities toward specific practical objectives. We do not issue requests for proposals for basic research on given projects and, although typically two to three times as many proposals for basic research are received as are funded, we do not make competitive evaluations in the usual sense of proposals that are received. Our control of basic research is through the choice of the fields in which research grants and contracts are awarded. Our choice of research investigators is almost entirely on the basis of their competence to perform research in these fields. In categories of research and development other than basic research, however, university proposals, whether solicited or unsolicited, are subjected to substantially the same tests as those from industry or other non-profit institutions.

DOD has no responsibility, and indeed no authority, to generally support or enhance education as such. Nevertheless, being fully cognizant of the workings of the mechanisms I have already described, we are aware of the impact which our university contract and grant programs may have of educational programs, particularly at the graduate level. I believe that for the most part DOD and the other mission-oriented agencies of the Government have conducted their basic research programs with universities with a long-term outlook, giving broad consideration to the interaction between research and graduate education. Nevertheless, with the growing size of the Federal research program at universities and the recognition of the degree to which this program could influence the future of universities, there has been growing concern in the academic community and in the public lest there be some diminution in the independence and quality of university research and development programs.

President Johnson, on September 13, 1965, gave direction to all Federal agencies in a memorandum to Heads of Departments and Agencies on "Strengthening Academic Capability

for Science Throughout the Country."

This memorandum included the following statement:

The strength of the research and development programs of the major agencies, and hence their ability to meet national needs, depends heavily upon the total strength of our university system. Research supported to further agency missions should be administered not only with a view to producing specific results, but also with a view to strengthening academic institutions and increasing the number of institutions capable of performing research of high quality.

The President's memorandum also highlighted the need to build new centers of scientific excellence in our universities throughout the nation. The Defense Department responded by initiating Project THEMIS, with the objective of establishing new university research programs in scientific areas of interest to DOD. The objective of broadening both the institutional and geographical distribution of DOD research funds was clearly stated, and universities and colleges were informed that their current level of DOD research funding would be considered as a negative factor in evaluating their proposals. The appropriated funding levels for Project THEMIS are \$19 million and \$26 million for the FY 1967 and FY 1968, respectively, and the first increment of programs has already been initiated at 42 colleges and universities.

The Armed Services Procurement Regulation (ASPR) contains numerous provisions which recognize the special character of educational institutions. For example, such institutions may be furnished government facilities without charge or other consideration, may acquire surplus government property, and may receive payments in advance of cost incurrence without interest, pursuant to advance payment cost agreements; simplified method of accounting and reporting of professional time and effort are acceptable, as are simpler and more flexible property accountability procedures. The cost principles of ASPR XV, Part 3, which apply to universities are essentially those of Bureau of the Budget Circular A-21, and recognize the particular fiscal

practices and activities of universities. On the other hand, the ASPR authorizes cost sharing in contracts with universities, a practice which is virtually forbidden for industrial contracts. Also universities, as distinct from their separately organized and managed research centers, generally receive no fee for their efforts and so must absorb any unallowable or disallowable costs in their general funds.

A major milestone in the DOD university research programs was attained in 1958, when Congress enacted a law permitting the use of grants for basic research. The grant is a simple instrument, devoid of most of the usual contract "boilerplate," requiring a minimum of bookkeeping and financial reporting, and permitting the grantee a high degree of flexibility in the performance of his research. Although grants were very attractive to university research scientists, many university administrators were soon disenchanted with them, first of all because of a Congressional mandate in the Defense Department Appropriations bill in FY 1963 limiting grant overhead to 20 percent. Subsequently, this was replaced by a requirement for cost sharing in grants which still applies. Nevertheless, although practices among government agencies vary, the Air Force still believes that the grant is often the best instrument for the support of basic research, and roughly half of the Air Force university basic research program is in the form of grants.

The major current problems of universities and colleges with government-financed research and development have to do more with their concerns about stability of funding, than with particular provisions of contract and grant agreements. University commitments to faculty, staff and graduate students almost always span periods of time greater than the usual DOD one-year budget cycle. This has been recognized for a long time and, to varying degrees, government agencies have attempted to provide university research funding for greater than a one-year period. For example, Project THEMIS is fully funded for the first year plus two-thirds of the second year and one-third of the third year. However, only a small part of the uni-

(Continued on Page 26)



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Maj. Gen. Thomas H. Scott Jr., USA, has been designated as Executive Dir., Supply Operations, Defense Supply Agency. He succeeds RAdm. John W. Bottoms, USN, whose next assignment will be as Commanding Officer, Naval Supply Center, Norfolk, Va.

Brig. Gen. Chester J. Butcher, USAF, has been assigned duty as Dep. Dir. for Concepts and Operational Readiness, Defense Communications Planning Group, Defense Communications Agency.

RAdm. Joseph L. Howard, (SC), USN, has succeeded Maj. Gen. John A. Goshorn, USA, as Dep. Dir., Defense Contract Administration Services, Defense Supply Agency.

Col. Albert J. Brown, USAF, has been assigned to the Defense Communications Agency as Chief of the Plans Div.

Capt. M. W. Harris, USN, has reported for duty to the Defense Electronics Supply Center, Dayton, Ohio, as Dir. of Production and Procurement.

Capt. Frank D. McMullen Jr., USN, has been designated as Dep. Asst. to the Secretary of Defense (Atomic Energy).

Col. Harold G. Wells Jr., USAF, has been named Dep. Commander, Eastern Region, Military Traffic Management and Terminal Service, Brooklyn, N.Y.

DEPARTMENT OF THE ARMY

Robert E. Jordan has been appointed General Counsel, Department of the Army. He has been serving as Acting General Counsel since September 1967.

Brig. Gen. Hugh F. Foster Jr., has been designated Dep. Commanding General for Systems Acquisition, Strategic Communications Command, Fort Huachuca, Ariz. Gen. Foster will also continue in his present job as Commanding General, Communications Systems Agency, Fort Monmouth, N.J.

Brig. Gen. Clarence C. Harvey Jr., Dep. Commanding General, Air Defense Systems, Army Missile Command, Redstone Arsenal, Ala., has retired from the Army after 30 years service.

Col. Harry C. Besancon has been named Chief of Staff, Army Weapons Command, Rock Island, Ill.

Col. Thomas N. Chavis has succeeded Col. Francis J. Pallister as Dir., Missiles and Space, Office of the Chief of Research and Development, Department of the Army.

Col. Clyde L. Friar has been ordered to Pine Bluff Arsenal, Ark., for duty as Commanding Officer.

Col. Leonard M. Orman succeeds Brig. Gen. Chester H. Johnson as Dep. Commander, Army Weapons Command, Rock Island, Ill.



Gen. William C. Westmoreland, USA, former commander, U.S. Military Assistance Command, Vietnam, was sworn in as The Chief of Staff, U.S. Army, on July 3 in Pentagon ceremonies. He succeeds Gen. Harold K. Johnson, USA, who retired. Gen. Westmoreland, 54, is a native of Spartanburg, S.C. He is a 1936 graduate of the U.S. Military Academy, West Point, N.Y. During his 32 years of service, Gen. Westmoreland has commanded the 101st Airborne Division and Ft. Campbell, Ky., and has been Superintendent of the U.S. Military Academy.

Col. Chester C. Sargeant is the U.S. Army Test and Evaluation Command's new Systems Test Manager for the Main Battle Tank-70 Program at Aberdeen Proving Ground, Md. In another change at the Test and Evaluation Command, Col. LeRoy S. Stanley succeeded Col. Robert B. Tully as Dir., Infantry Materiel Testing.

DEPARTMENT OF THE NAVY

RAdm. James C. Dempsey has succeeded RAdm. Reynold D. Hogle as Commandant, Fifth Naval Dist., Norfolk, Va. Adm. Hogle has retired after 43 years of Naval service.

RAdm. Spencer R. Smith has been named Dep. Commander for Management, Naval Facilities Engineering Command.

Capt. Andrew Bodnaruk has been assigned as Officer-in-Charge, Annapolis Div., Navy Ship Research and Development Center.

Capt. Arthur H. Cummings Jr. is the new Exec. Asst. and Naval Aide to the Asst. Secretary of the Navy (Research and Development).

Capt. Stanley T. Ebel has been assigned duty as Officer-in-Charge, San Diego Div., Navy Ship Engineering Center, San Diego.

Capt. Theodore R. Fick has taken command of the Navy Research and Development Laboratory, San Francisco, Calif.

Capt. William J. Maddocks is the new Commanding Officer, Navy Weapons Station, Yorktown, Va.

Capt. Charles N. Payne Jr. has relieved RAdm. E. H. Batcheller as Commander, Charleston Naval Shipyard, Charleston, S. C.

Capt. Robert H. St. Clair Jr. has assumed command of the Pacific Missile Range Facility Hawaiian Area. He relieved Capt. Robert W. Rynd, who has retired.

Capt. Thomas J. Christman, Commanding Officer, Naval Ammunition Depot, Crane, Ind., and Capt. Douglas H. Lyness Jr., Commanding Officer, Navy Fleet Material Support Office, Mechanicsburg, Pa., have been selected for promotion to rear admiral.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. Gordon M. Graham has succeeded Lt. Gen. Albert P. Clark, as Vice Commander, Tactical Air Command. Gen. Graham will be promoted to the rank of Lieutenant General with the assignment. Gen. Clark has been reassigned as Commander, Air University, Maxwell AFB, Ala.

Maj. Gen. Leo P. Dusard has been named Vice Commander, Air Training Command, Randolph AFB, Tex.

Brig. Gen. Walter E. Williams Jr., has been assigned as Vice Commander, Tactical Air Warfare Center, Eglin AFB, Fla.

The following assignments have been made at USAF Headquarters:

Maj. Gen. Glenn A. Kent, Asst. Chief of Staff (Studies & Analysis); Brig. Gen. Maurice F. Casey, Dir., Transportation, Office of Dep. Chief of Staff (Systems & Logistics); Col. Harvey W. Eddy, (brigadier general selectee), Dep. Dir., Development; Col. Lee M. Paschall, (brigadier general selectee), Dep. Dir., Command Control & Communications, Office of Dep. Chief of Staff (Programs & Resources); and Col. Alfred C. Bigum, Dep. Asst. for Research & Development Programming, Office of Dep. Chief of Staff (Research & Development).

The following assignments have been made in the Air Force Systems Command (AFSC):

Maj. Gen. Joseph J. Cody Jr., Commander, Electronic Systems Div., L. G. Hanscom Field, Mass.; Maj. Gen. Paul T. Cooper, Chief of Staff, AFSC Hq.; Maj. Gen. Lee V. Gossick, Vice Commander, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; Brig. Gen. Louis L. Wilson, Jr., Vice Commander, Space & Missile Systems Organization, Los Angeles, Calif.; Brig. Gen. Felix M. Rogers, Dep. Chief of Staff for Development Plans, AFSC Hq.; Brig. Gen. Maurice A. Cristadoro, Asst. Dep. Chief of Staff for Development Plans, AFSC Hq.; Col. Alfred L. Esposito, (brigadier general selectee), Asst. Dep. Systems Program Dir., F-111 Program, Aeronautical Systems Div.; Col. James E. Paschall, Vice Commander, Air Force Special Weapons Center, Kirtland AFB, N. M.; Col. Alton D. Slay, (Brigadier General Selectee), Vice Commander, Air Force Flight Test Center, Edwards AFB, Calif.; Col. Charles T.

Urquhart, Asst. Dep. for Maintenance, Space & Missile Systems Organization; and Lt. Col. Joseph A. Guthrie Jr., Chief, Test and Deployment, C-5 System Program Office, Aeronautical Systems Div.

The following assignments have been made in the Air Force Logistics Command (AFLC):

Maj. Gen. Abe J. Beck, Commander, Warner Robins Air Materiel Area, Robins AFB, Ga.; Brig. Gen. William W. Snavelly, Dep. Commander, Oklahoma City Air Materiel Area, Tinker AFB, Okla.; Col. Dean E. Hess, Dir., Office of Information, AFLC Hq., Wright-Patterson AFB, Ohio; Col. Jack K. Massie, Vice Commander, 2802 Inertial Guidance/Calibration Group, Newark Air Force Station, Ohio; and Col. Warner E. Newby, (brigadier general selectee), Asst. Dep. Chief of Staff (Maintenance Engineering), AFLC Hq.

Role of Universities in Government-Financed Research

(Continued from Page 24)

University basic research program has this or similar forward funding, and virtually none of the exploratory and advanced development at universities has forward funding. Moreover, much university planning was based on the assumption that the Federal research funding growth rate of the last decade would continue indefinitely. However, at the \$2 billion level, Federal funding of basic research is already in competition with other important national needs and wants. Not only is the need for a continuing high rate of growth being questioned by the public and in Congress, but also the necessity and desirability of current levels is being scrutinized. While the general notion that research is a good thing is not being questioned, it is being pointed out that there can be too much of a good thing.

From the standpoint of the Defense Department, there is no doubt that a continuing high level of activity and progress in fields of research relevant to military technology is essential to assure our national security. There are vast areas of advancing science and technology which must be explored and watched, not only to identify military opportunities for ourselves and our allies but also to guard against technological sur-

Charge Set on Hard Copy Tech Reports

The Defense Documentation Center (DDC) initiated a service charge for all hard copies of technical reports effective July 1, 1968.

Full text of all reports will continue to be available to all users in microform at no charge. In addition all DDC services and products, except hard copies of technical reports will continue to be provided at no charge.

The Department of Commerce's Clearinghouse for Federal Scientific and Technical Information is responsible for collecting and handling all financial transactions with DDC users. Both DDC and the Clearinghouse have disseminated detailed information directly to DDC users concerning the new policy.

prise from our potential enemies. Believe that this is clearly indicated by the history of the past 50 years. It would take too long here to address the non-military benefits of an aggressive national basic research program, but it can be safely said that they, too, are considerable. And to assure the continuing health of our science and technology in the long term, we must assure the continuing vitality of scientific research in our universities. Those of us charged with responsibility for the research and development program of the Defense Department have been virtually unanimous in asserting these convictions in the councils of the Federal Government and in our appearances before the Congress.

It is difficult to predict what will be the future course of science and technology, and what changes will take place in our society, our economy, and our international posture as a result. Certainly it is apparent that we have much to learn about how to meet the rapid change in our environment which science and technology can bring about. But we can be sure that the universities will continue to have a vital role not only in our scientific and technological progress, but in helping us to learn to live with that progress and shaping it to our ends.

STATUS OF FUNDS

DEPARTMENT OF DEFENSE Military Functions and Military Assistance Program Quarterly Report

Prepared by:

Directorate for Financial Analysis and Control
Office of the Assistant Secretary of Defense (Comptroller)
Room 3C 839, The Pentagon, Phone: (202) OXford 7-2332

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Expenditures Third Quarter, Fiscal Year 1968 (Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Expenditures				Unpaid obligations	
	Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	At start of year	As of Mar. 31, 1968
Military Personnel						
Active forces	1,675,758	1,525,726	1,517,796	13,681,915	850,076	1,238,606
Reserve forces	48,948	50,052	53,639	351,596	149,863	118,295
Retired pay	174,953	175,406	176,509	1,537,297	7,622	6,620
Undistributed	-36,296	-35,690	-30,266	-22,579	—	22,579
Total—Military Personnel	1,863,363	1,715,494	1,717,679	15,847,331	1,007,561	1,386,098
Operation and Maintenance	1,687,111	1,557,146	1,698,107	14,886,759	3,542,486	3,588,957
Procurement						
Aircraft	872,262	841,871	712,149	7,179,232	9,317,974	8,260,081
Missiles	221,358	184,723	203,411	1,633,542	1,929,015	2,091,706
Ships	119,704	87,504	105,011	1,118,053	3,049,781	3,009,229
Tracked combat vehicles	38,497	42,686	39,092	342,171	632,680	557,190
Ordnance, vehicles, and related equipment	641,551	581,203	377,205	4,401,242	6,721,730	7,090,498
Electronics and communications	165,851	163,801	128,959	1,125,559	1,998,176	1,768,265
Other procurement	231,211	192,996	240,632	1,669,051	1,947,502	1,802,526
Undistributed	-16,575	-181,540	-126,942	55,939	-386,056	-452,702
Total—Procurement	2,273,863	1,913,242	1,679,517	17,524,791	25,210,802	24,126,793
Research, Development, Test, and Evaluation						
Military sciences	93,341	93,370	80,642	766,781	867,381	776,515
Aircraft	71,664	99,500	94,250	860,313	796,125	921,948
Missiles	205,150	207,150	206,010	1,914,673	1,095,907	1,231,080
Astronautics	72,727	82,268	117,063	895,232	649,793	534,206
Ships	25,443	22,916	20,334	225,709	212,773	215,061
Ordnance, vehicles, and related equipment	29,237	24,299	28,508	261,790	235,442	228,529
Other equipment	78,231	47,687	63,533	573,548	541,757	502,088
Program-wide management and support	38,558	37,504	47,253	354,785	163,038	143,294
Undistributed	-33,946	-44,399	-31,795	-12,747	-194,032	-182,757
Total—Research, Development, Test, & Eval.	580,407	570,294	625,886	5,840,086	4,368,185	4,369,960
Military Construction	123,610	105,058	90,178	968,807	1,581,256	1,409,875
Family Housing	44,682	6,330	46,045	369,814	114,964	205,458
Civil Defense	8,161	11,905	10,312	80,653	91,893	77,648
Other—Special Foreign Currency Program	39	265	1	1,215	2,193	1,146
Revolving and Management Funds	323,721	299,178	209,515	985,321	527,834	323,778
Subtotal—Military Functions	6,904,956	6,178,914	6,077,237	56,504,776	36,447,172	35,489,217
Military Assistance	72,474	38,683	44,165	374,117	2,112,357	1,654,786
TOTAL—DEPARTMENT OF DEFENSE	6,977,430	6,217,597	6,121,403	56,878,894	38,559,529	37,144,003

* Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,800,000.
NOTE: Detail may not add to rounded totals.

DEPARTMENT OF THE ARMY

	Expenditures				Unpaid obligations	
	Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	At start of year	As of Mar. 31, 1968
Military Personnel						
Active forces	688,854	604,539	585,102	5,405,836	392,872	652,170
Reserve forces	29,915	26,080	30,782	424,638	112,152	86,606
Undistributed	-19,774	-53,606	-24,980	-38,481	—	38,481
Total—Military Personnel	698,995	577,013	596,904	5,791,993	505,024	777,257
Operation and Maintenance	722,641	628,339	644,381	5,756,176	1,252,029	1,203,619
Procurement						
Aircraft	82,567	100,297	83,942	823,493	1,303,735	995,927
Missiles	34,784	30,839	41,489	269,344	458,264	645,024
Tracked combat vehicles	38,069	42,448	38,752	339,777	611,133	533,765
Ordnance, vehicles, and related equipment	279,921	336,168	235,819	2,024,730	3,887,912	3,382,886
Electronics and communications	55,384	82,590	51,489	430,627	780,554	661,594
Other procurement	70,355	81,840	76,600	573,761	817,300	655,124
Undistributed	-8,324	-175,306	-131,916	37,949	-886,056	-481,920
Total—Procurement	552,757	498,876	396,174	4,499,681	6,972,842	6,442,390
Research, Development, Test, and Evaluation						
Military sciences	15,429	14,914	13,953	118,796	133,665	114,289
Aircraft	9,357	9,851	6,996	106,548	85,463	71,799
Missiles	55,906	65,037	57,094	507,728	435,876	518,694
Astronautics	1,577	1,011	1,624	14,290	15,069	8,652
Ordnance, vehicles, and related equipment	14,795	15,891	14,007	138,986	136,432	123,568
Other equipment	29,940	28,233	28,279	236,560	218,437	197,413
Program-wide management and support	7,840	6,383	6,378	61,872	39,835	42,044
Undistributed	-20,472	-45,887	-29,206	-7,985	-194,032	-187,519
Total—Research, Development, Test, & Eval.	114,372	95,433	99,305	1,176,795	870,745	888,940
Military Construction	68,781	47,059	26,679	517,737	818,076	671,271
Revolving and Management Funds	84,632	85,221	98,642	481,116	58,732	-27,431
TOTAL—DEPARTMENT OF THE ARMY	2,242,179	1,931,941	1,856,085	18,223,499	10,477,449	9,956,046

DEPARTMENT OF THE NAVY

	Expenditures				Unpaid obligations	
	Jan. 1968	Feb 1968	Mar. 1968	Cum. thru Mar. 31, 1968	At start of year	As of Mar. 31, 1968
Military Personnel						
Active forces	511,116	463,976	444,905	4,065,892	232,405	271,364
Reserve forces	10,499	11,817	12,579	111,703	19,698	21,223
Undistributed	-15,692	1,188	9,517	15,037	—	-15,037
Total—Military Personnel	505,923	476,981	467,001	4,192,632	252,103	277,550
Operation and Maintenance	332,809	350,416	414,224	3,798,236	* 1,234,696	1,327,192
Procurement						
Aircraft	236,824	274,828	236,084	2,431,008	* 3,505,672	2,667,423
Missiles	71,583	27,806	37,809	335,360	470,557	532,337
Ships	119,704	87,504	105,011	1,118,503	3,049,781	3,009,229
Tracked combat vehicles	428	238	340	2,394	21,547	23,425
Ordnance, vehicles, and related equipment	198,446	138,645	75,293	1,162,272	1,611,746	1,886,223
Electronics and communications	56,488	42,206	45,058	367,420	656,337	589,790
Other procurement	87,346	70,206	132,473	664,305	921,116	998,562
Undistributed	-9,782	-4,808	4,809	12,911	—	-15,674
Total—Procurement	811,038	636,623	686,829	6,093,724	10,236,796	9,691,315
Research, Development, Test, and Evaluation						
Military sciences	15,266	12,617	11,691	149,030	127,323	112,704
Aircraft	22,596	33,588	30,303	251,259	260,838	224,916
Missiles	78,251	53,236	83,803	681,194	293,783	296,623
Astronautics	2,842	1,132	1,294	17,427	12,677	12,648
Ships	25,443	22,916	20,384	225,709	212,773	215,061
Ordnance, vehicles, and related equipment	14,442	8,408	14,501	122,804	99,010	104,961
Other equipment	21,705	9,769	11,009	99,916	89,328	80,610
Program-wide management and support	12,069	9,567	16,029	101,016	97,989	84,047
Undistributed	-13,499	-707	-300	-6,090	—	6,090
Total—Research, Development, Test, & Eval.	179,115	150,525	188,715	1,642,265	1,193,721	1,137,661
Military Construction	3,847	17,007	30,364	53,840	269,300	441,085
Revolving and Management Funds	201,343	233,394	183,595	379,931	462,849	387,374
TOTAL—DEPARTMENT OF THE NAVY	2,034,076	1,864,947	1,970,730	16,160,632	13,649,465	13,262,173

* Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,300,000.

DEPARTMENT OF THE AIR FORCE

	Expenditures				Unpaid obligations	
	Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	At start of year	As of Mar. 31, 1968
Military Personnel						
Active forces	475,788	457,211	487,789	4,209,287	224,799	315,072
Reserve forces	8,584	12,155	10,278	115,255	18,013	10,466
Undistributed	-830	16,728	-14,803	865	—	-865
Total—Military Personnel	483,492	486,094	483,264	4,325,407	242,812	324,673
Operation and Maintenance	542,647	498,385	556,776	4,591,317	955,856	960,603
Procurement						
Aircraft	502,871	466,746	342,173	3,924,731	4,508,567	4,500,731
Missiles	114,991	126,078	124,113	1,028,838	1,000,194	914,345
Ordnance, vehicles & related equipment	162,565	106,069	65,807	1,211,474	1,719,842	1,820,352
Electronics and communications	53,790	37,734	32,155	322,252	555,915	511,021
Other procurement	70,124	39,906	26,183	406,899	164,740	108,236
Undistributed	1,680	-1,229	65	5,031	—	-5,051
Total—Procurement	906,023	775,304	590,496	6,899,226	7,949,258	7,945,636
Research, Development, Test, and Evaluation						
Military sciences	15,619	13,327	15,744	125,964	131,619	114,817
Aircraft	39,711	56,061	56,951	502,506	449,824	625,228
Missiles	70,993	88,877	65,113	725,751	366,248	415,763
Astronautics	68,308	80,125	114,145	863,515	622,047	512,900
Other equipment	26,586	9,685	24,245	237,072	233,992	224,065
Program-wide management and support	18,649	21,554	24,846	191,897	25,214	17,203
Undistributed	25	2,195	-2,433	1,328	—	-1,328
Total—Research, Development, Test & Eval.	239,892	271,824	298,611	2,648,033	1,828,944	1,908,656
Military Construction	49,492	36,655	32,095	381,485	473,206	286,281
Revolving and Management Funds	23,456	-15,871	-58,820	-5,025	6,252	-33,907
TOTAL—DEPARTMENT OF THE AIR FORCE	2,245,005	2,052,392	1,902,418	18,840,442	11,456,328	11,391,942

August 1968

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Expenditures				Unpaid obligations	
	Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	At start of year	As of Mar. 31, 1968
Military Personnel						
Retired pay	174,953	175,407	176,508	1,537,297	7,622	6,620
Operation and Maintenance	89,012	80,006	82,725	741,028	99,905	97,545
Procurement						
Ordnance, vehicles, and related equipment	619	321	286	2,766	2,230	1,037
Electronics and communications	189	1,271	257	5,260	5,330	5,860
Other procurement	3,386	1,044	5,376	24,086	44,346	40,604
Undistributed	-149	-197	100	48	—	-48
Total—Procurement	4,044	2,439	6,018	32,160	51,906	47,454
Research, Development, Test, and Evaluation						
Military sciences	47,027	52,512	39,254	372,991	474,774	434,705
Military Construction	1,489	4,337	1,040	15,744	20,674	10,739
Family Housing	44,682	6,330	46,045	369,814	114,964	205,458
Other—Special Foreign Currency Program	39	265	1	1,215	2,193	1,146
Revolving and Management Funds	14,292	-3,570	-13,900	129,250	—	-2,259
TOTAL—DEFENSE AGENCIES/OSD	375,537	317,727	337,693	3,199,500	772,037	801,408

OFFICE OF CIVIL DEFENSE

Civil Defense	8,161	11,905	10,312	80,653	91,893	77,648
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	8,161	11,905	10,312	80,653	91,983	77,648

MILITARY ASSISTANCE

Military Personnel	12	5	35	214	525	295
Operation and Maintenance	19,076	20,283	22,534	184,128	289,568	240,898
Procurement						
Aircraft	11,638	4,527	4,200	58,115	235,101	186,427
Missiles	309	169	1,454	4,519	23,650	15,413
Ships	2,827	7,472	1,401	16,625	114,450	105,742
Ordnance, vehicles, and related equipment	11,357	7,818	6,836	74,114	264,633	211,347
Electronics and communications	2,896	2,510	3,388	29,461	132,402	102,542
Other procurement	1,934	3,711	6,624	30,203	127,226	109,594
Total—Procurement	30,963	26,207	23,903	213,037	897,462	731,065
Research, Development, Test, and Evaluation	—	—	—	-980	401	79
Military Construction	897	-6,304	-1,960	2,703	171,824	6,827
Revolving Fund	17,405	-999	6,239	-12,657	764,607	680,195
Undistributed	4,120	-507	-6,588	-12,329	-12,030	-3,972
TOTAL—MILITARY ASSISTANCE	72,474	38,683	44,165	874,117	2,112,857	1,654,786

Obligations

Third Quarter, Fiscal Year 1968
(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Mar. 31, 1968
		Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	
Military Personnel						
Active forces	19,001,605	1,637,226	1,596,930	1,594,538	14,308,542	4,693,063
Reserve forces	958,750	51,108	60,149	55,882	620,574	338,176
Retired pay	2,020,000	174,875	175,091	176,382	1,535,727	484,273
Total—Military Personnel	21,980,355	1,863,209	1,832,172	1,826,800	16,464,843	5,515,512
Operation and Maintenance	21,114,442	1,934,887	1,603,173	1,660,410	16,291,860	4,822,581
Procurement						
Aircraft	13,017,519	648,877	611,161	553,730	6,402,066	6,615,453
Missiles	3,098,769	237,761	172,301	335,209	1,885,939	1,212,830
Ships	4,896,298	122,266	114,042	195,815	1,141,552	3,754,746
Tracked combat vehicles	491,870	858	41,974	29,817	274,369	217,501
Ordnance, vehicles and related equipment	8,963,515	462,884	689,576	599,151	5,820,092	3,143,423
Electronics and communications	2,343,202	139,061	100,351	105,020	972,406	1,370,796
Other procurement	3,001,550	172,036	135,266	184,568	1,600,857	1,400,693
Undistributed	406,008	—	—	—	—	406,008
Total—Procurement	36,218,733	1,783,738	1,864,675	2,003,312	18,097,284	18,121,448
Research, Development, Test, & Evaluation						
Military sciences	1,158,421	89,364	59,685	56,324	720,862	437,559
Aircraft	1,445,543	168,789	67,398	60,688	1,015,958	429,585
Missiles	2,518,929	146,676	203,694	125,763	2,112,183	406,746
Astronautics	1,279,820	114,160	86,862	87,194	864,693	415,127
Ships	384,978	24,767	19,497	23,731	242,052	142,926
Ordnance, vehicles, and related equipment	386,854	20,536	33,201	32,165	263,250	123,604
Other equipment	899,630	60,294	56,461	57,018	550,695	348,935
Program-wide management and support	772,426	53,395	45,458	49,386	468,903	303,523
Emergency Fund	—	—	—	—	—	—
Undistributed	-80,854	—	—	—	—	-80,854
Total—Research, Development, Test, & Eval.	8,765,746	677,981	572,256	497,270	6,238,596	2,527,150
Military Construction	3,181,904	98,534	109,432	121,732	928,790	2,253,113
Family Housing	874,031	64,683	37,690	43,263	466,016	408,065
Civil Defense	108,603	11,787	11,857	7,268	68,039	40,564
Other—Special Foreign Currency Program	16,344	—	—	—	168	16,176
Subtotal—Military Functions	92,260,205	6,434,822	6,031,252	6,165,053	58,555,593	33,704,613
Military Assistance	287,362	9,959	60,713	-75,741	166,580	120,783
TOTAL—DEPARTMENT OF DEFENSE	92,547,568	6,444,780	6,091,965	6,089,312	58,722,173	33,825,394

DEPARTMENT OF THE ARMY

	Available for obligation	Obligations				Unobligated balance
		Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	Mar. 31, 1968
Military Personnel						
Active forces	7,874,405	683,861	643,774	635,627	5,816,457	2,057,948
Reserve forces	644,100	30,306	35,661	32,338	398,801	245,299
Total—Military Personnel	8,518,505	714,168	679,436	667,966	6,215,258	2,303,247
Operation and Maintenance	8,191,306	730,848	619,444	689,950	6,279,181	1,912,125
Procurement						
Aircraft	1,218,880	94,923	66,626	85,054	522,273	696,607
Missiles	705,682	28,175	37,234	138,323	497,650	208,032
Tracked combat vehicles	475,953	666	41,383	29,647	270,097	205,856
Ordnance, vehicles and related equipment	5,059,756	286,306	375,345	284,033	3,064,164	1,995,592
Electronics and communications	880,686	21,327	40,099	20,051	354,336	526,350
Other procurement	946,636	22,798	27,531	46,454	441,078	505,558
Undistributed	318,096	—	—	—	—	318,096
Total—Procurement	9,605,689	454,197	588,218	603,562	5,149,598	4,456,091
Research, Development, Test, & Evaluation						
Military sciences	183,264	14,387	12,584	10,243	123,201	60,063
Aircraft	150,553	7,986	7,622	4,695	93,932	56,626
Missiles	706,425	58,487	114,129	24,793	602,904	103,521
Astronautics	12,222	435	1,226	2,170	7,961	4,261
Ordnance, vehicles and related equipment	198,070	11,338	12,083	12,629	134,452	63,618
Other equipment	416,255	24,925	21,925	28,620	223,677	192,578
Program-wide management and support	85,085	4,493	5,611	6,968	67,450	17,635
Undistributed	106,677	—	—	—	—	106,677
Total—Research, Development, Test & Eval.	1,858,556	122,051	175,180	90,118	1,253,577	604,979
Military Construction	1,293,993	52,015	25,206	55,038	403,505	890,488
TOTAL—DEPARTMENT OF THE ARMY	29,468,048	2,073,279	2,087,482	2,106,634	19,301,118	10,166,930

DEPARTMENT OF THE NAVY

	Available for obligation	Obligations				Unobligated balance Mar. 31, 1968
		Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	
Military Personnel						
Active forces	5,479,900	476,609	473,695	473,696	4,167,146	1,312,754
Reserve forces	154,620	12,568	14,037	12,981	113,552	41,068
Total—Military Personnel	5,634,520	489,175	487,734	486,676	4,280,698	1,353,822
Operation and Maintenance	5,821,006	561,705	386,166	404,895	4,331,348	1,499,658
Procurement						
Aircraft	3,973,091	194,014	227,852	186,353	1,611,022	2,362,069
Missiles	775,598	41,857	23,008	57,207	408,517	367,081
Ships	4,896,298	122,266	114,042	195,815	1,141,552	3,754,746
Tracked combat vehicles	15,917	192	591	170	4,272	11,645
Ordnance, vehicles and related equipment	2,173,652	86,125	171,293	196,997	1,442,371	731,281
Electronics and communications	810,634	65,717	38,606	52,218	305,847	504,787
Other procurement	1,431,088	82,801	74,571	114,194	780,954	650,134
Undistributed	-258,589	—	—	—	—	-258,589
Total—Procurement	13,817,689	592,966	649,965	802,956	5,694,536	8,123,154
Research, Development, Test, and Evaluation						
Military sciences	203,049	16,352	12,480	13,443	139,764	63,285
Aircraft	362,073	79,290	10,772	28,070	215,497	146,576
Missiles	821,783	23,273	34,914	41,093	691,919	129,864
Astronautics	23,608	1,909	1,593	2,808	17,611	5,997
Ships	384,978	24,767	19,497	28,731	242,052	142,926
Ordnance, vehicles and related equipment	188,784	9,198	21,118	19,536	128,798	59,986
Other equipment	149,379	7,101	14,556	7,171	92,626	56,753
Program-wide management and support	422,290	29,274	20,798	28,328	206,497	215,793
Undistributed	-88,893	—	—	—	—	-88,893
Total Research, Development, Test & Eval.	2,467,051	191,164	135,728	169,180	1,734,764	732,287
Military Construction	1,090,349	29,207	50,942	42,176	323,959	766,390
TOTAL—DEPARTMENT OF THE NAVY	28,840,617	1,864,217	1,710,535	1,905,883	16,365,805	12,475,312

August 1968

DEPARTMENT OF THE AIR FORCE

	Available for obligation	Obligations				Unobligated balance
		Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	Mar. 31, 1968
Military Personnel						
Active forces	5,647,300	476,756	479,461	485,215	4,324,939	1,322,361
Reserve forces	160,030	8,234	10,451	10,563	108,221	51,809
Total—Military Personnel	5,807,330	484,990	489,913	495,775	4,433,160	1,374,170
Operation and Maintenance						
	6,056,990	548,632	519,523	479,354	4,901,572	1,155,418
Procurement						
Aircraft	7,825,548	359,940	316,683	282,323	4,268,771	3,556,777
Missiles	1,617,489	167,729	112,059	139,679	979,772	637,717
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,725,319	90,420	142,935	117,711	1,311,984	413,335
Electronics and communications	638,445	51,314	20,425	31,243	306,433	332,012
Other Procurement	555,039	63,809	30,680	19,646	350,395	204,644
Undistributed	346,346	—	—	—	—	346,346
Total—Procurement	12,708,187	733,212	622,783	590,600	7,217,355	5,490,831
Research, Development, Test & Evaluation						
Military sciences	184,858	12,786	10,815	12,564	121,405	63,453
Aircraft	932,912	81,513	49,004	27,923	706,529	226,383
Missiles	990,721	64,916	54,651	59,877	817,360	173,361
Astronautics	1,243,990	111,816	84,043	82,216	839,121	404,869
Other equipment	333,996	28,268	19,980	21,227	234,392	99,604
Program-wide management and support	265,051	19,623	19,049	14,090	194,956	70,095
Undistributed	—98,638	—	—	—	—	—98,638
Total—Research, Development, Test & Eval.	3,852,889	318,929	237,541	217,898	2,913,763	939,126
Military Construction						
	713,759	17,107	29,442	24,292	195,517	518,242
TOTAL—DEPARTMENT OF THE AIR FORCE	29,139,155	2,102,869	1,899,203	1,807,919	19,661,367	9,477,787

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Mar. 31, 1968
		Jan. 1968	Feb. 1968	Mar. 1968	Cum. thru Mar. 31, 1968	
Military Personnel						
Retired Pay	2,020,000	174,875	175,091	176,382	1,535,727	484,273
Operation and Maintenance	1,035,139	93,703	78,039	86,211	779,759	255,380
Procurement						
Ordnance, vehicles and related equipment	4,788	33	3	410	1,573	3,215
Electronics and communications	13,437	703	1,221	1,508	5,790	7,646
Other procurement	68,787	2,628	2,484	4,274	28,430	40,357
Undistributed	155	—	—	—	—	155
Total—Procurement	87,167	3,363	3,709	6,192	35,793	51,374
Research, Development, Test, and Evaluation						
Military sciences	587,250	45,839	23,806	20,074	336,492	250,758
Emergency Fund	—	—	—	—	—	—
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test & Eval.	587,250	45,839	23,806	20,074	336,492	250,758
Military Construction	83,803	205	3,842	226	5,809	77,991
Family Housing	874,081	64,683	37,690	48,263	466,016	408,065
Other—Special Foreign Currency Program	16,344	—	—	—	168	16,176
TOTAL—DEFENSE AGENCIES/OSD	4,703,783	382,668	322,177	337,348	3,159,765	1,544,018

OFFICE OF CIVIL DEFENSE

Civil Defense	108,603	11,787	11,857	7,268	68,039	40,566
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MILITARY ASSISTANCE

Military Personnel	—17	—48	56	—46	—17	—
Operation and Maintenance	255,681	9,143	18,772	—11,001	135,409	120,222
Procurement						
Aircraft	9,945	1,728	21,865	—27,004	9,440	563
Missiles	—3,554	208	1,003	1,104	—3,717	161
Ships	8,006	15	6,754	—4,309	7,917	1
Ordnance, vehicles and related equipment	20,828	—287	5,695	—5,722	20,828	—
Electronics and communications	—397	—237	3,127	—10,047	—399	—
Other procurement	12,778	—624	2,466	—3,693	12,023	11
Total—Procurement	47,606	803	40,910	—49,761	46,692	9
Research, Development, Test, and Evaluation	—1,300	—	—	—	—1,301	—
Military Construction	—13,940	69	1,000	—14,953	—14,182	2
Undistributed	—616	—9	—23	18	—21	—51
TOTAL—MILITARY ASSISTANCE	287,362	9,959	60,713	—75,741	166,580	120,771

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS (Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	III	IV	1968 Jan	Feb	Mar	I	Apr	May
I. Military Primes Contract Awards¹														
Aircraft	\$ 1,944	\$ 2,985	\$ 2,696	\$ 2,261	\$ 2,101	\$ 3,049	\$ 2,512	\$ 2,632	\$ 442	\$ 529	\$ 574	\$ 1,545	\$ 834	\$ 1,129
Missile and Space Systems	997	957	1,244	843	1,162	1,140	1,525	1,045	345	419	387	1,151	337	449
Ships	354	491	871	239	679	406	416	409	108	77	236	421	79	224
Weapons and Ammunition	545	1,482	692	931	815	1,768	1,103	1,335	225	416	382	1,023	423	431
Electronic & Communications														
Equipment	861	1,543	605	907	922	1,813	719	811	308	259	240	807	328	407
Combat Vehicles	114	221	139	195	57	235	173	99	26	79	30	135	62	35
Other Hard Goods	721	1,615	831	831	856	1,337	1,054	554	214	269	276	759	252	285
Soft Goods	709	921	1,077	989	637	651	491	437	437	139	202	778	218	211
Construction	207	382	1,197	149	232	624	212	212	61	53	67	181	39	195
Services	392	584	1,449	506	481	555	1,483	734	163	141	184	488	162	116
Educational & Non-Profit Institutions	198	214	1,197	119	235	205	253	149	95	84	40	219	52	30
Awards Under \$10,000	936	1,241	849	1,054	1,013	1,295	779	821	261	305	325	891	324	346
Total	7,978	12,646	10,536	9,024	9,190	13,068	10,838	9,292	2,685	2,770	2,943	8,398	3,090	3,858
Total, Seasonally Adjusted	8,814	10,132	10,646	10,220	10,328	10,632	10,413	10,413	2,887	3,445	3,185	9,517	3,488	4,203
Work Outside U. S.	521	1,195	856	672	453	834	891	455	288	139	134	561	157	135
II. Gross Obligations Incurred														
Operations	8,326	9,604	10,426	9,702	10,229	11,435	11,224	10,812	3,798	3,435	3,487	10,721	3,799	
Procurement	4,374	8,339	5,368	5,276	5,113	8,948	6,154	6,292	1,784	1,862	2,003	5,652	2,239	
Other	2,429	3,470	3,453	2,230	2,519	3,510	3,420	2,194	863	792	553	2,206	742	
Total	15,129	21,613	19,247	17,208	17,861	23,893	20,798	19,298	6,445	6,092	6,043	18,579	6,780	
III. Gross Unpaid Obligations Outstanding														
Operations	3,828	3,777	4,792	5,024	4,044	4,513	5,267	5,150	5,127	5,127	4,975	4,975	4,938	
Procurement	18,023	22,119	22,736	23,173	22,780	25,248	24,925	24,856	24,197	24,024	24,127	24,127	23,947	
Other	5,625	5,942	8,026	7,253	6,996	7,506	7,971	7,360	7,329	7,303	7,038	7,038	6,848	
Total	27,476	31,838	35,554	35,450	34,420	37,267	38,163	37,366	36,653	36,454	36,140	36,140	35,733	
IV. Net Expenditures														
Operations	7,689	9,076	8,966	9,087	10,002	10,731	10,001	10,494	3,550	3,273	3,416	10,239	3,622	
Procurement	3,651	3,886	4,392	4,264	5,074	5,282	6,060	5,598	2,274	1,913	1,680	5,887	2,109	
Other	2,757	2,647	2,484	3,092	3,160	2,001	3,047	2,363	1,153	1,032	1,025	3,210	1,175	
Total	14,097	15,609	15,844	16,443	18,236	18,014	19,108	18,455	6,977	6,218	6,121	19,316	6,906	
V. DOD Personnel Compensation														
Military	3,181	3,249	3,551	3,606	3,624	3,646	3,842	3,972	1,338	1,339	1,338	4,014	1,343	
Civilian	1,837	2,015	2,105	2,135	2,170	2,248	2,271	2,332	828	774	773	2,375	803	\$44(p)
Total	5,118	5,264	5,656	5,741	5,794	5,894	6,113	6,304	2,166	2,113	2,111	6,389	2,146	
VI. Outstanding Payments														
Advance Payments	66	79	90	83	92	80	110	134				128		
Progress Payments	4,402	4,346	4,750	5,461	5,981	6,765	7,179	7,491				7,681		
Total	4,468	4,425	4,840	5,544	6,073	6,845	7,289	7,625				7,809		
VII. Strength (Manpower)														
Military	2,969	3,094	3,229	3,344	3,371	3,377	3,412	3,398	3,427	3,440	3,467	3,467	3,494	
Civilian	1,088	1,138	1,184	1,230	1,268	1,303	1,274	1,271	1,267	1,265	1,266	1,266	1,267	1,271(p)

P = Preliminary

I = Revised—See new definition.

Note: Open spaces for indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis.

Totals may not add due to rounding.

Directorate for Statistical Services
OASD(Comptroller)
June 28 1968



Contracts of \$1,000,000 and over awarded during the month of June 1968:

DEFENSE SUPPLY AGENCY

- 3—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-5 jet fuel:
 - Beacon Oil Co., Hanford, Calif. \$1,099,454. 7,700,000 gallons. DSA 600-69-D-0002.
 - Douglas Oil Co., Los Angeles, Calif. \$2,660,900. 21,000,000 gallons. DSA 600-69-D-0004.
 - Edgington Oil Refineries, Long Beach, Calif. \$1,638,000. 12,000,000 gallons. DSA 600-69-D-0005.
 - Fletcher Oil & Refining Co., Carson, Calif. \$1,846,050. 13,500,000 gallons. DSA 600-69-D-0006.
 - Golden Eagle Refining Co., Los Angeles, Calif. \$4,266,033. \$1,500,000 gallons. DSA 600-69-D-0007.
 - Gulf Oil, New York, N.Y. \$3,866,652. 37,475,100 gallons. DSA 600-69-D-0008.
 - Humble Oil & Refining Co., Houston, Tex. \$10,095,859. 100,464,000 gallons. DSA 600-69-D-0012.
 - Mobil Oil, New York, N.Y. \$7,077,640. 66,600,000 gallons. DSA 600-69-D-0015.
 - Phillips Petroleum Co., Bartlesville, Okla. \$1,633,163. 12,070,000 gallons. DSA 600-69-D-0016.
 - Sun Oil Co., Philadelphia, Pa. \$2,108,119. 18,480,000 gallons. DSA 600-69-D-0017.
 - Union Oil Co., Los Angeles, Calif. \$2,289,827. 17,178,000 gallons. DSA 600-69-D-0018.
 - U.S. Oil & Refining Co., Tacoma, Wash. \$1,543,487. 11,459,100 gallons. DSA 600-69-D-0019.
- Hess Oil & Chemical Corp., Perth Amboy, N.J. \$5,470,088. 397,000 barrels of combat gasoline, 290,000 barrels of diesel fuel grade DF-1 and 595,000 barrels of diesel marine fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1789.
- Union Oil Co., Los Angeles, Calif. \$5,389,080. 1,830,000 barrels of Navy special fuel oil and 500,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1773.
- Humble Oil & Refining Co., Houston, Tex. \$3,850,991. 634,000 barrels of combat gasoline, type one. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1772.
- Atlantic Richfield Co., Los Angeles, Calif. \$2,776,140. 1,060,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2073.
- Union Oil Co., Los Angeles, Calif. \$2,712,710. 250,000 barrels of diesel fuel oil, grade DF-A, and 327,000 barrels of diesel marine fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1173 P001.
- Marathon Oil Co., Findlay, Ohio. \$2,487,100. 570,000 barrels of diesel fuel oil, grade DF-1. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1771.
- Golden Eagle Refining Co., Los Angeles, Calif. \$2,276,125. 850,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2072.

CONTRACT LEGEND

Contract information is listed in the following sequence: Data—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting agency—Contract number.

DEFENSE PROCUREMENT

- Continental Oil Co., Houston, Tex. \$1,393,960. 848,000 barrels of diesel marine fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1770.
- Edgington Oil Refineries, Long Beach, Calif. \$1,204,950. 450,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1780.
- 5—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-4 jet fuel:
 - Sunray DX Oil Co., Tulsa, Okla. \$2,768,900. 80,000,000 gallons. DSA 600-69-D-0095.
 - Southland Oil Co., Yazoo City, Miss. \$1,103,428. 10,150,000 gallons. DSA 600-69-D-0083.
 - Howell Refining Co., San Antonio, Tex. \$4,127,338. 87,500,000 gallons. DSA 600-69-D-0058.
 - Tonkawa Refining Co., Abilene, Tex. \$2,623,840. 24,000,000 gallons. DSA 600-69-D-0098.
 - Diamond Shamrock Corp., Amarillo, Tex. \$4,250,205. 36,753,000 gallons. DSA 600-69-D-0044.
 - Bell Oil & Gas Co., Bartlesville, Okla. \$5,069,197. 54,000,000 gallons. DSA 600-69-D-0052.
 - Monarch Refining Co., San Antonio, Tex. \$1,024,800. 9,000,000 gallons. DSA 600-69-D-0074.
 - Macmillan King-Free Oil Co., Los Angeles, Calif. \$2,008,400. 22,000,000 gallons. DSA 600-69-D-0088.
 - Adobe Refining Co., Midland, Tex. \$3,661,887. 83,000,000 gallons. DSA 600-69-D-0020.
 - Tesoro Petroleum Corp., San Antonio, Tex. \$2,054,740. 18,000,000 gallons. DSA 600-69-D-0095.
 - American Petroleum Co., Dallas, Tex. \$4,159,855. 42,000,000 gallons. DSA 600-69-D-0024.
 - Atlantic Richfield Co., Los Angeles, Calif. \$5,170,050. 42,000,000 gallons. DSA 600-69-D-0028.
 - Cities Service Oil Co., New York, N.Y. \$2,426,012. 25,200,000 gallons. DSA 600-69-D-0087.
 - Standard Oil Co., San Francisco, Calif. \$2,248,146. 217,929,600 gallons. DSA 600-69-D-0091.
 - Bayou Refining Co., Pasadena, Tex. \$3,115,235. 31,000,000 gallons. DSA 600-69-D-0030.
 - Phillips Petroleum Co., Bartlesville, Okla. \$7,247,918. 65,058,000 gallons. DSA 600-69-D-0080.
 - Cardinal Transports, San Antonio, Tex. \$1,170,530. 11,000,000 gallons. DSA 600-69-D-0084.
 - Sloux Oil Co., New Castle, Wyo. \$2,400,000. 20,000,000 gallons. DSA 600-69-D-0087.
 - Champion Petroleum Co., Fort Worth, Tex. \$1,237,500. 12,500,000 gallons. DSA 600-69-D-0035.
 - Kerr-McGee Corp., Oklahoma City, Okla. \$1,889,000. 15,000,000 gallons. DSA 600-69-D-0064.
 - Edgington Oil Refineries, Long Beach, Calif. \$2,143,000. 17,000,000 gallons. DSA 600-69-D-0046.
 - Humble Oil & Refining Co., Houston, Tex. \$2,631,701. 274,324,000 gallons. DSA 600-69-D-0059.
 - Southwestern Oil & Refining Co., Corpus Christi, Tex. \$1,669,920. 16,800,000 gallons. DSA 600-69-D-0089.
 - Hunt Oil Co., Dallas, Tex. \$1,104,000. 11,500,000 gallons. DSA 600-69-D-0060.
 - Shell Oil Co., New York, N.Y. \$1,618,600. 15,000,000 gallons. DSA 600-69-D-0084.
 - Sinclair Refining Co., New York, N.Y. \$2,362,500. 21,000,000 gallons. DSA 600-69-D-0086.
 - Sun Oil Co., Philadelphia, Pa. \$8,864,920. 78,488,000 gallons. DSA 600-69-D-0092.
 - Gulf Oil Corp., New York, N.Y. \$14,653,500. 141,000,000 gallons. DSA 600-69-D-0055.
 - Hess Oil & Chemical Corp., Perth Amboy, N.J. \$2,844,450. 28,400,000 gallons. DSA 600-69-D-0057.
- Signal Oil & Gas Co., Houston, Tex. \$2,410,800. 26,200,000 gallons. DSA 600-69-D-0085.
- Getty Oil Co., New York, N.Y. \$4,959,045. 44,058,000 gallons. DSA 600-69-D-0051.
- Constat States Petrochemical Co., Houston, Tex. \$18,810,755. 184,750,000 gallons. DSA 600-69-D-0088.
- Douglas Oil Co., Los Angeles, Calif. \$2,633,600. 22,000,000 gallons. DSA 600-69-D-0045.
- Union Oil Co., Los Angeles, Calif. \$6,649,986. 55,504,000 gallons. DSA 600-69-D-0100.
- Triangle Refineries, Houston, Tex. \$2,672,175. 23,560,000 gallons. DSA 600-69-D-0099.
- 6—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-4 jet fuel:
 - Fletcher Oil & Refining Co., Carson, Calif. \$3,594,542. 27,500,000 gallons. DSA 600-69-D-0049.
 - Sequoia Refining Corp., Corpus Christi, Tex. \$1,103,023. 11,592,000 gallons. DSA 600-69-D-0088.
 - Mobil Oil, New York, N.Y. \$23,139,016. 210,000,000 gallons. DSA 600-69-D-0072.
 - American Oil, Chicago, Ill. \$4,385,936. 43,957,000 gallons. DSA 600-69-D-0023.
 - Continental Oil, Houston, Tex. \$9,749,068. 100,037,800 gallons. DSA 600-69-D-0040.
 - Oklmulgee Refining Co., Okmulgee, Okla. \$1,789,111. 18,840,000 gallons. DSA 600-69-D-0076.
 - Delta Refining Co., Memphis, Tenn. \$4,582,447. 41,076,000 gallons. DSA 600-69-D-0042.
 - Hercules Oil, Long Beach, Calif. \$1,221,551. 9,000,000 gallons. DSA 600-69-D-0056.
 - Ashland Oil & Refining Co., Ashland, Ky. \$7,764,115. 73,208,000 gallons. DSA 600-69-D-0027.
 - Fort Worth Refining Co., Houston, Tex. \$4,623,285. 42,863,000 gallons. DSA 600-69-D-0050.
 - Kern County Refinery Co., Los Angeles, Calif. \$2,230,782. 16,200,000 gallons. DSA 600-69-D-0063.
 - Good Hope Refineries, Houston, Tex. \$3,820,600. 37,000,000 gallons. DSA 600-69-D-0064.
 - Golden Eagle Refining Co., Los Angeles, Calif. \$5,853,740. 42,900,000 gallons. DSA 600-69-D-0053.
 - Crystal Flash Petroleum Corp., Indianapolis, Ind. \$1,613,846. 15,050,000 gallons. DSA 600-69-D-0041.
- 10—Orthopedic Equipment Co., Bourbon, Ind. \$1,123,403. 68,180 folding, rigid aluminum pole litters. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-68-C-4858.
- 11—Standard Oil Co. of Calif., San Francisco, Calif. \$1,714,920. 11,705,000 gallons of kerosene propellant. Defense Personnel Support Center, Philadelphia, Pa. DSA 600-69-D-0111.
- 13—Booth Packing Co., Modesto, Calif. \$1,505,822. 1,800,837 cases of combat meals. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-68-C-2005.
- Southern Packaging & Storage Co., Greenville, Tenn. \$2,888,586. Assembly of 3,954,100 cases of combat meals. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-68-C-2007.
- 17—Tanbaum Textile Co., Inc., New York, N.Y. \$4,323,213. 4,508,000 yards of wind resistant cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2603.
- Prestex, Inc., New York, N.Y. \$1,025,860. 1,100,000 yards of wind resistant cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2602.
- J. P. Stevens & Co., Inc., New York, N.Y. \$1,833,280. 1,500,000 yards of wind resistant cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2601.

- Oscar Mayer & Co., Madison, Wis. \$1,054,242. 828,000 cans of ham hunks. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-8-C-14623.
- 18--Dole Co., San Jose, Calif. \$1,003,236. 561,120 cases of pineapple juice. Defense Personnel Support Center, Philadelphia, Pa. DSA 137-8-C-0001.
- 19--Major Coat Co., Bridgeton, N.J. \$1,344,979. 87,350 men's polyester wool tropical coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-87-C-2870.
- Reflective Laminates, Inc., Newbury Park, Calif. \$1,095,478. 10,728 plates of body armor and 7,928 body armor carriers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-88-C-2884.
- 20--Shell Oil Co., New York, N.Y. \$1,479,767. 3,077,000 gallons of grade 115/145 aviation gasoline; 412,000 gallons of grade 100/130 aviation gasoline; 1,466,000 gallons of JP-4 jet fuel; 890,000 gallons of ASTF 640 commercial jet fuel and 50,300 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-88-D-2136.
- Gulf Oil Corp., Houston, Tex. \$6,095,715. 31,686,000 gallons of gasoline and 17,798,000 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-88-D-2010.
- 25--M&B Headwear Co., Richmond, Va. \$1,689,690. 761,000 hats with camouflage pattern insect nets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2732.
- Gibraltar Fabrics, Brooklyn, N.Y. \$1,593,000. 200,000 poncho liners. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2726.
- Rachman Mfg. Co., Reading, Pa. \$1,016,116. 63,150 body armor vests. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2727.
- 26--Landis Clothes, Vineland, N.J. \$1,008,872. 60,000 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2736.
- 28--Page Airways, Inc., Rochester, N.Y. \$1,422,990. Operation and maintenance of the Defense Industrial Plant Equipment Facility, Atchison, Kan. Defense Industrial Plant Equipment Center, Memphis, Tenn. DSA 002-68-C-0002.
- Met-Pro Water Treatment Corp., Lansdale, Pa. \$2,589,166. Water purification equipment sets. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9773.
- Delta Petroleum Co., New Orleans, La. \$1,263,848. 2,778,203 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 640-68-D-0107.
- Continental Steel Corp., Kokomo, Ind. \$1,226,192. 99,360 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-A176.
- CF&I Steel Corp., Denver, Colo. \$1,651,500. 150,000 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-A178.
- Northwestern Steel & Wire Co., Sterling, Ill. \$1,391,040. 120,960 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-A174.



DEPARTMENT OF THE ARMY

- 3--Page Aircraft Maintenance, Inc., Fort Rucker, Ala. \$29,529,599. Performance of organization, direct and general support maintenance, and schedule inspections of rotary and fixed-wing aircraft. Fort Stewart, Ga. Army Aviation Center, Fort Rucker, Ala.
- Day & Zimmermann, Inc., Philadelphia, Pa. \$44,123,398. Loading, assembling, and packing of miscellaneous ammunition items, and for maintenance of plant facilities at the Lone Star Army

- Ammunition Plant, Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00114 (A).
- Beaver State Contractors, Mossy Rock, Wash. \$3,645,886. Clearing and grading work at the Libby Dam Project. Lincoln County, Mont. Engineer Dist., Seattle, Wash. DA CW67-68-C-0078.
- Colt's, Inc., Hartford, Conn. \$1,163,469. Twenty-round magazine assemblies for the M16/M18A1 rifle. Army Weapons Command, Rock Island, Ill. DA AF03-68-C-0049.
- 4--General Motors, Detroit, Mich. \$4,757,470. Work on the XM70 Main Battle Tank. Cleveland, Ohio and Milwaukee, Wis. Tank Automotive Command, Warren, Mich. DA 20-113-AMC-08848 (T).
- Continental Aviation & Engineering Corp., Detroit, Mich. \$1,525,000. Engineering support for production of the LD/LDS 465 family of multi-fuel engines. Tank Automotive Command, Warren, Mich. DA AE07-67-C-5606.
- Lockheed Aircraft Corp., Sunnyvale, Calif. \$1,397,873. Equipment and services in connection with underground nuclear testing at the Nevada Test Site. Sunnyvale, Calif.; Seattle, Wash. and the Nevada Test Site. Defense Atomic Support Agency, DA SA01-68-C-0146.
- 5--E. J. Freethly, El Cerrito, Calif. \$2,513,608. Construction work at the Corte Madera Creek Project. Marin Co., Calif. Engineer Dist., San Francisco, Calif. DA CW68-C-0053.
- Chamberlain Mfg. Co., Elmhurst, Ill. \$4,828,698. Metal parts for 165mm projectiles. Servanton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0365.
- Northrop Carolina, Inc., Asheville, N.C. \$2,628,140. 40mm cartridges. Swannanoa, N.C. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0082.
- Harvey Aluminum, Torrance, Calif. \$1,226,420. Metal parts for 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AG07-68-C-0053.
- 6--Phalo Corp., Shrewsbury, Mass. \$1,733,238. Cable assemblies with electrical connector plugs and preformed wire grips. Laredo, Tex. Electronics Command, Philadelphia, Pa. DA AB06-68-C-0038.
- Consolidated Box Co., Tampa, Fla. \$2,445,561. Ammunition containers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0476.
- United Ammunition Container Corp., Philadelphia, Pa. \$1,233,881. Fiber ammunition containers. Atlanta, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0476.
- Penland Paper Converting Corp. \$1,214,069. Ammunition fiber containers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0477.
- 7--Sperry Rand Corp., Phoenix, Ariz. \$1,200,336. ID-908/ASN indicators and AM-3209/ASN amplifiers for aircraft flight control systems. Salt Lake City, Utah and Phoenix, Ariz. Army Procurement Agency, Pasadena, Calif. DA AG07-68-C-1290.
- Raytheon Co., Lexington, Mass. \$2,227,750. Metal parts for bombs. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0027.
- M-B Contracting Co., Seattle, Wash. \$1,084,543. Construction of taxiway pavements at Elmendorf AFB, Alaska. Engineer Dist., Anchorage, Alaska. DA CA85-68-C-0020.
- Hughes Tool Co., Culver City, Calif. \$1,499,100. OH-6A helicopters, \$2,405,308. OH-6A transmission assemblies. Aviation Materiel Command, St. Louis, Mo. DA 23-204-AMC-03897.
- 10--Honeywell, Inc., Hopkins, Minn. \$1,984,000. Grenade fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0232.
- Hardaway Contracting Co., Columbus, Ga. \$2,304,600. Construction and dredging work at the Pencee de Leon Inlet Project. Daytona, Fla. Engineer Dist., Jacksonville, Fla. DA CW17-68-C-0087.
- Blount Bros., Montgomery, Ala. \$1,875,000. Rehabilitation, conversion, and new construction at the Army Ammunition Plant, Ravenna, Ohio. Engineer Dist., Louisville, Ky. DA CA27-68-C-0045.

- Raymark Cargo, Inc., Oakland, Calif. \$1,822,792. Packing container services at the Oakland Army Base, Oakland, Calif. Western Area, Military Traffic Management and Terminal Service, Oakland, Calif. DA HC23-68-D-0078.
- 11--Consolidated Diesel Electric Co., Old Greenwich, Conn. \$28,585,799. 1 1/4-ton cargo trucks. Charlotte, N.C. and Schenectady, N.Y. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2806.
- General Motors, Detroit, Mich. \$5,615,003. Diesel engines for M561 cargo trucks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2597.
- Bell Helicopter, Fort Worth, Tex. \$1,421,851. Flight control cylinder assemblies for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- Great Lakes Dredge & Dock Co., New Orleans, La. \$2,281,650. Work on the Mississippi River and Tributaries, Atchafalaya Basin Floodway Project. Iberville Parish, La. Engineer Dist., New Orleans, La. DA CW29-68-C-0203.
- 12--Akwa Downey Construction Co., Milwaukee, Wis. \$1,238,828. Construction of a communication electronic shop and an addition to an existing auto maintenance shop including site preparation, excavation and all support utilities. MacDill AFB, Fla. Engineer Dist., Jacksonville, Fla. DA CA17-68-C-0048.
- Texas Instruments, Inc., \$1,500,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- Hughes Aircraft, Culver City, Calif. \$1,342,458. Iroquois Night Fighter and Night Tracker (INFANT). Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0188.
- Atlantic Gulf & Pacific Co., New York, N.Y. \$1,676,845. Dredging work on the Newport News, Va. channel project. Engineer Dist., Norfolk, Va. DA CW85-68-C-0080.
- Lockheed Electronics Co., Plainfield, N.J. \$2,060,951. Radar sets for XM163 Weapons System (Vulcan Air Defense). Metuchen, N.J. Frankford Arsenal, Philadelphia, Pa. DA AA26-67-C-0028.
- Meyer Casket Co., Lynn, Ind. \$1,377,248. Metal caskets. Western Area, Military Traffic Management and Terminal Service, Oakland, Calif. DA HC23-68-D-0096.
- RCA, Camden, N.J. \$12,218,705. Operation and maintenance of Government-owned radar systems and target acquisition systems at the White Sands Missile Range N.M. White Sands Missile Range, N.M. DA AD07-68-C-0162.
- General Dynamics, Pomona, Calif. \$2,748,410. Redeye trainer systems. Army Missile Command, Huntsville, Ala. DA AH01-68-C-1582.
- 13--Thiokol Chemical Corp., Woodbine, Ga. \$1,922,360. Technical chemical agent. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0707.
- G. A. McDonald Construction Co. and R. P. Burruss, Montrose, Calif. \$1,429,960. Work on the Oro Grade Wash Project. Victorville, Calif. Engineer Dist., Los Angeles, Calif. DA CW00-68-C-0053.
- 14--LTV ElectroSystems, Inc., Huntington, Ind. \$4,266,034. Vehicular radio communication sets. Electronics Command, Philadelphia, Pa. DA AB05-67-C-0171.
- Northrop Corp., Rolling Meadows, Ill. \$2,981,733. Radio set components. Chicago and Cicero, Ill. Electronics Command, Philadelphia, Pa. DA AB06-68-C-0031.
- ElectroSpace Corp., Glen Cove, N.Y. \$2,260,476. Radio sets and components. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0034.
- Philco-Ford Corp., Newport Beach, Calif. \$7,025,190. Shilleagh guided missiles. Hawthorne, Calif. Army Missile Command, Huntsville, Ala. DA AH01-67-C-0002.
- Sylvania Electric Products, Inc., Mountaintop, Pa. \$5,954,803. Classified work. Mountain View and Santa Cruz, Calif. Mobility Equipment Command, Fort Belvoir, Va. DA AK02-68-C-0210.
- Brunswick Corp., Sugar Grove, Va. \$3,351,100. 4.2-inch projectile canisters filled with technical chemical agent. Smyth County, Va. Edgewood Arsenal, Md. DA AA15-68-C-0722.

- Mohawk Rubber Co., Akron, Ohio. \$2, 144,688 5-ton truck pneumatic tires. West Helena, Ark., and Salem, Va. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2764.
- Allison Steel Mfg. Co., Phoenix, Ariz. \$1,616,644 Bridge road beds for pontoon bridges. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-8088
- Honeywell, Inc., Hopkins, Minn. \$1-283,364. XM224 bomb fuzes. Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0490.
- AVCO Corp., Nashville, Tenn. \$1,066,724 Ballistic cases for Lance wheeled sections. Nashville, Tenn., and Wilmington, Mass. Army Procurement Agency, Cincinnati, Ohio. DA AG31-68-C-0758
- Whirlpool Corp., Evansville, Ind. \$1-036,774 152mm canisters. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0757
- Ammann & Whitney, N.Y., N.Y. \$3, 115,546. Architect engineer services for design of Sentinel Perimeter Acquisition Radar (PAR) Facilities, excluding design of the power and support facilities. The PAR Facilities will be located at Boston, Mass., and Detroit, Mich. Engineer Dist., Huntsville, Ala. DA CA87-68-C-0011.
- 17—Chamberlain Mfg. Corp., Waterloo, Iowa. \$1,381,826 Metal parts for 275-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0363.
- Colt's, Inc., Hartford, Conn. \$15,780,937. M16A1 and M16(5.56mm) rifles. Army Weapons Command, Rock Island, Ill. DA AF03-68-C-0061.
- Whirlpool Corp., Evansville, Ind. \$1-040,918. 90mm projectiles, XM594. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0750.
- Sharpe and Hamaker, Inc., Arlington, Va. \$1,286,682. Construction of a Night Vision Simulator Laboratory at Fort Belvoir, Va. Engineer District, Norfolk, Va. DA CA65-68-C-0174
- 18—Del E. Webb Corp., Los Angeles, Calif. \$10,917,100. Construction of 10 enlisted men's barracks and support facilities at Fort Ord, Calif. Engineer District, Sacramento, Calif. DA CA05-68-C-0092.
- Canon Construction Co., Beverly Hills, Calif. \$2,711,300. Construction of 150 family housing units, Presidio of San Francisco, Calif. Engineer District, Sacramento, Calif. DA CA05-68-C-0090.
- Honeywell, Inc., Hopkins, Minn. \$1,182,726 Facilities to increase the production capacity for grenade fuzes at the Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11022-ORD-2395.
- Burroughs Corp., Paoli, Pa. \$1,237,489. Automatic message processing system equipment. Electronics Command, Ft. Monmouth, N.J. DA 28043-AMC-02238(E).
- 19—Chrysler Corp., Highland Park, Mich. \$1,026,100. 175mm high explosive projectiles. Gateway Army Ammunition Plant, St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0006.
- Universal Industries, Inc., Chicago, Ill. \$2,678,500. AN/TCC-50 terminal telephones. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0642.
- Concrete Pavers, Inc., Tampa, Fla. \$1-811,171. Construction of taxiway and runway access Numbers 1 and 2, and operational apion addition at Pope AFB-Fort Bragg, N.C. Engineer District, Savannah, Ga. DA CA21-68-C-0083.
- Southern Airways of Texas, Inc., Fort Worth, Tex. \$28,270,000. Helicopter pilot training and maintenance of aircraft and related equipment. Purchasing and Contracting Office, Fort Worth, Tex. DA BD13-68-C-0009
- Hawthorne Aviation, Fort Rucker, Ala. \$2,567,591. Aircraft maintenance services on fixed and rotary wing aircraft and related test support. Calins Army Airfield, Fort Rucker, Ala. Aberdeen Proving Grounds, Md. DA 18001-AMC-1122(R).
- Ford Motor Co., Highland Park, Mich. \$5,477,937 1 1/2-ton utility trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0001.
- 20—Aberthaw Construction Co., Washington, D.C. \$3,545,000 Construction of a combined Federal Regional Center and National Civil Defense Computer Center for the Office of Civil Defense Region 2. Olney, Md. Engineer Dist., Baltimore, Md. DA CA31-68-C-0113.
- Western Electric Co., New York, N.Y. \$1,337,950 Testing of Sentinel missile components. \$13,768,200. Additional research and development for the Sentinel missile defense system. Work will be done by the Bell Telephone Labs., Whippany, N. J. (\$4,031,150); Raytheon Co., Wayland, Mass. (\$3,500,000); IBM Corp., Cranford, N.J. (\$3,300,000); Douglas McDonnell Corp., Santa Monica, Calif. (\$3,000,000); Lockheed Electronics Corp., Los Angeles (\$250,000); and Martin Co., Orlando, Fla. (\$125,000). Sentinel System Command, Redstone Arsenal, Ala. DA 30-069-AMC-00938(Y).
- General Motors, Indianapolis, Ind. \$2-647,700 XTC-111-2A transmission components for M109, 155mm-howitzers. Tank Automotive Command, Warren, Mich. DA AE07-68-C-0836.
- Thiokol Chemical Corp., Woodbine, Ga. \$1,190,016. Chemical agent, CS2. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0677.
- Brunswick Corp., Sugar Grove, Va. \$1-621,450. Chemically filled (GS-2) 35mm cartridges. Edgewood Arsenal, Edgewood, Md. DA 18035-68-AMC-0062
- A. O. Smith Corp., Chicago, Ill. \$4,104,641. Metal parts for 750-lb bombs. Bellmead, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0078.
- Lear Siegler, Inc., Anaheim, Calif. \$2-906,440. M125A1 metal parts for fuzes, M557. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0376.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$3,660,016. Metal parts for 105mm smoke projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0489.
- Craig Systems Corp., Lawrence, Mass. \$1,299,568. Shelters for electrical equipment. Electronics Command, Philadelphia, Pa. DA AB05-67-C-2786.
- DeKalb Commercial Body Corp., DeKalb, Ill. \$2,261,178. Shelters for electrical equipment. Electronics Command, Philadelphia, Pa. DA AB05-68-C-1726.
- 21—Markwell and Hart, Inc., Memphis, Tenn. \$2,510,060. Work on the Caddo Dam (replacement) Project. Caddo Parish, La. Engineer Dist., New Orleans, La. DA GW29-68-C-0219.
- Mine Safety Appliances Co., Pittsburgh, Pa. \$1,342,522. Multi-year procurement for M17A-1 field protective masks. Esmond, R.I. Edgewood Arsenal, Edgewood, Md. DA AA15-67-C-0205.
- Cutter-Hammer, Inc., Deer Park, N.Y. \$1,011,500. AN/PPS-4 radar sets and related items. Electronics Command, Fort Monmouth, N.J. DA 28-043-AMC-02158E.
- General Electric, Syracuse, N.Y. \$3-767,041. AN/MPQ-4 Radar sets. Electronics Command, Philadelphia, Pa. DA AB05-67-C-2341.
- Westinghouse Electric Corp., Baltimore, Md. \$2,794,735. Redesigning and modifying AN/TPS 27 radars to AN/TPS-48 configuration. White Sands Missile Range, N.M. DA AD07-68-C-0278.
- Fairchild Camera and Instrument Corp., Syoset, N.Y. \$3,145,080. M514A1E1 artillery proximity fuzes. Coptague, N.Y. Harry Diamond Labs., Washington, D.C. DA AG30-67-C-0080.
- Raytheon Co., Bristol, Tenn. \$3,066,120. M514A1E1 artillery proximity fuzes. Harry Diamond Labs., Washington, D.C. DA AG39-67-C-0087.
- Greenfield Construction Co., Inc., Livonia, Mich. \$2,585,120. Work on the Saginaw River-Flint River, Michigan Flood Control Project. Flint, Mich. Engineer Dist., Detroit, Mich. DA CW35-68-C-0089.
- Bowen-McLaughlin-York Co., York, Pa. \$1,031,816. Retrofit of M48A1 tanks to the M48A3 configuration. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0076.
- Missouri Research Labs, Inc., St. Charles, Mo. \$1,101,036. 195-patient ward containers—a service element component of self-contained, transportable medical units (MUST). Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-8162.
- Hercules Engines, Inc., Canton, Mo. \$5,417,847. LD405-1 multi fuel engine assemblies for 2 1/2-ton trucks. Automotive Command, Warren, Mich. DA AE06-68-C-0006.
- Continental Motors Corp., Mobile, Ala. \$1,400,000. Remanufacture of government-furnished AVDS 1790-28 engines with metal containers. Bley AFB, Ala. Tank Automotive Command, Warren, Mich. DA AE07-68-C-1166.
- General Motors Corp., Detroit, Mich. 948,362. 8V71T diesel engines for vehicles. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2551.
- North Electric Co., Gallon, Ohio. \$115,840. Tactical Automatic Switch System (SATSS) for Seventh Air Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0376.
- Talley Industries, Inc., Mesa, Ariz. 534,626 Colored smoke canisters. 1 wood Arsenal, Edgewood, Md. DA A 68-C-0741.
- Columbus Milpar Mfg. Co., Columbus, Ohio. \$1,146,500. Fin assemblies for inch rockets. Picatinny Arsenal, D. N.J. DA AA21-67-C-0426.
- Bell Helicopter Co., Fort Worth, Tex. \$1,151,000. Improved attitude indicator systems for AH-1G helicopters. F Tex. Aviation Materiel Command, Louisville, Mo. DA AJ01-68-C-0489.
- Barber-Greene Co., Aurora, Ill. \$1 535. Five asphalt mixing plants. Mo Equipment Command, St. Louis, Mo. AK01-67-C-0778.
- The Army Aviation Materiel Command, St. Louis, Mo., has awarded the following five contracts to AVCO Corp., Hartford, Conn.:
- \$5,042,869. Special test equipment and special tooling to increase production capability for T53L13 engines. DA AJ01-68-C-1993
- \$3,281,625. Preproduction effort to increase production capability for T53L13 engines. Charleston, S.C. AJ01-68-C-1876.
- \$9,000,000. Expansion of production facilities for T53L13 turbine engines. Charleston, S.C. DA AJ01-68-C-1767.
- \$1,855,400. Repair of production lots for T53L13 engines. DA AJ01-68-C-1767.
- \$46,157,550. T53L13 engines for Cobra helicopters. Stamford, Conn. Charleston, S.C. DA AJ01-68-C-1767.
- John Wood Co., St. Paul, Minn. 276,552. Fin assemblies (M181A1) 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 68-C-0484.
- R. G. LeTourneau, Inc., Longview, Tex. \$2,304,720. M181A1 fin assemblies 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. AA09-68-C-0485.
- Poloron Products, Inc., New Rochelle, N.Y. \$1,491,000. M181A1 fin assemblies for 750-lb. bombs. Scituate, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0486.
- 24—Western Electric, New York, N.Y. 480,000. Overhaul of Nike Hercules missiles. Burlington, N.C. Army Materiel Command, Huntsville, Ala. DA 67-A-0037.
- Brunswick Corp., Sugar Grove, Va. 058,200. Chemical filled canisters. wood Arsenal, Edgewood, Md. DA 68-C-0765.
- Franchi Construction Co., N. Mass. \$3,177,500. Rehabilitation of existing buildings to provide lab and administration facilities for Army Materiel Research Agency, town Arsenal, Watertown, Mass. England Div., Corps of Engineers, Hingham, Mass. DA CA33-68-C-0040.
- Colt's, Inc., Hartford, Conn. \$2.9 5.56mm rifles. Army Weapons Command, Rock Island, Ill. DA AF03-68-C-0061.
- Akwa-Downey Construction Co., Waukegan, Wis. \$2,598,998. Construct six 200-man dormitories. MacDill Fla. Engineer Dist., Jacksonville DA CA17-68-C-0063.
- Ryan Aeronautical Co., San Calif. \$2,121,717. Line items of parts in support of the MQM-341 get Missile Flight Services Program. Army Missile Command, Huntsville DA 04-495-AMC-1105 Z).

- Continental Aviation & Engineering Corp., Toledo, Ohio \$1,580,832 Line items for repair parts in support of the MQM-34D Target Missile Flight Services Program Army Missile Command, Huntsville, Ala DA AH01-68-A-0047
- Motorola, Inc., Scottsdale, Ariz \$1,433,300 Radar data receiver and transmitting sets Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0304
- AIRESEARCH Mfg. Co., Phoenix, Ariz. \$1,226,700. Gas turbine engines and containers for MUST. Mobility Equipment Command, St. Louis, Mo DA 23-105-AMC-00082
- Amelco, Inc., and Diz y Guardia, Panama City, Panama \$1,052,695. Construction of a 32-unit HQ and for alterations to dormitories at Howard AFB, Canal Zone, Engineer Dist., Jacksonville, Fla. DA CA17-68-C-0051
- General Dynamics, Rochester, N.Y. \$1,033,693. Radio teletypewriter sets Electronics Command, Philadelphia, Pa. DA AB06-68-C-0035
- 25-Studebaker Corp., Minneapolis, Minn \$7,524,394 Generator sets, Mobility Equipment Command, St. Louis, Mo DA AK01-68-C-8051
- Boeing Co., Mottom, Pa \$6,574,148. CH-47 Chinook helicopter spare parts. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005
- Lockheed Electronics Co., Plainfield, N.J. \$3,672,000. Radar equipment used in the fire control system of the 20mm anti-aircraft gun Metuchen, N.J. Frankford Arsenal, Philadelphia, Pa DA AA25-68-C-0718
- Curtis Wright Corp., East Paterson, N.J. \$3,152,642 Tactical imagery interpretation equipment Electronics Command, Philadelphia, Pa DA AB05-68-C-1233
- Craft Construction Co., Stockton, Calif. \$3,064,517. Construction of a flammable storage warehouse and for an addition to an existing warehouse at Shupe General Depot, Stockton, Calif. Engineer Dist., Sacramento, Calif. DA CA05-68-C-0104
- R. G. LeTorneau, Longview, Tex. \$1,938,240. Metal parts for 750-lb. bombs Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0030
- Norris Industries, Los Angeles, Calif \$1,305,906. 2.75-inch rocket motor tubes. Pico Rivera, Calif. Pictatinny Arsenal, Dover, N.J. DA AA21-67-C-0416
- John C. Cornell, Inc., Clovis, N.M. \$1,172,671. Construction of three dormitories. Cannon AFB, NM. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0088
- 26-Western Electric, New York, N.Y. \$1,406,600. Research and development for extended range of the Sprint Missile. Orlando, Fla. Sentinel System Command, Redstone Arsenal, Ala. DA 30-069-AMC-00393 (Y)
- Thiokol Chemical Corp., Huntsville, Ala. \$1,268,420. Development of Sprint composite propellant. Sentinel System Command, Redstone Arsenal, Ala. DA HC60-68-C-0043
- Philco Ford Corp., Palo Alto, Calif \$1,145,000. Satellite communications terminal at Kynajalein Missile Range. Sentinel System Command, Redstone Arsenal, Ala. DA HC60-68-C-0040
- Thompson Co. and Stearns-Roger Corp., St. Charles, Mo. \$20,656,114. Non-toxic defoliant. Edgewood Arsenal, Md. DA AA15-68-C-0691
- General Time Corp., Rolling Meadows, Ill. \$4,491,298. 165mm artillery round fuzes Frankford Arsenal, Philadelphia, Pa. DA AA26-68-C-0730
- Boeing Co., Morton, Pa. \$4,366,242. Transmission assemblies for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005
- S. J. Groves & Co., Ann Arbor, Mich. \$4,354,316. Construction of a dam and appurtenant works, Union City, Pa. Engineer Dist., Pittsburgh, Pa. DA CW50-68-C-0130
- Bunker-Ramo Corp., Canoga Park, Calif. \$3,009,909. A universal automatic map compilation system. Army Map Service, Washington, D.C. DA CA71-68-C-0134
- General Motors, Indianapolis, Ind. \$2,609,460. Breech mechanism assemblies for 152mm gun/launchers. Watervliet Arsenal, N.Y. DA AF07-68-C-0181
- National Union Electric Corp., Bloomington, Ill. \$1,989,240. Nose fuzes for 750-lb. bombs. Army Procurement Agency, Chicago, Ill. DA AA09-68-C-0386
- Kanarr Corp., Kingston, Pa. \$1,967,787. 10mm grenade launchers. Army Weapons Command, Rock Island, Ill. DA 11-199-AMC-00715 (W)
- Raytheon Co., Andover, Mass. \$1,712,400. Refurbishing and overhauling various major items of Hawk missile system. Fort Bliss, Tex. Army Missile Command, Huntsville, Ala. DA AH01-68-A-0037
- Raytheon Co., Andover, Mass. \$1,504,537. FY 1968 depot calibration publications and for a capability for self-propelled high-powered illuminators Army Missile Command, Huntsville, Ala. DA AH01-68-C-0706
- ARF Products, Ranton, N.M. \$1,507,422. Radio sets. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0038
- K.D.I. Precision Products, Cincinnati, Ohio. \$1,477,065. Fuse safety and arming devices for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0339
- Circle, Inc., Belle Chasse, La. \$1,465,119. Construction of hurricane protection works. New Orleans, La. Engineer Dist., New Orleans, La. DA CW29-68-C-0242
- General Electric, Burlington, Vt. \$1,340,130. 20mm automatic aircraft guns, gun pods and ancillary equipment. Burlington, Vt. and Springfield, Mass. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0057
- Kentrone, Hawaii, Ltd., Honolulu, Hawaii. \$1,259,846. Specialized augmenting services to support maintenance of calibration standards and test equipment in general electronics micro wave and other measurements supporting the U.S. Army in the Pacific Contracting Division, U.S. Army Hawaii DA 94-600-PAC-05639
- Gencarelli, Inc., Westerly, R.I. \$1,145,128. Construction of a breakwater and causeway at Plymouth Harbor, Mass. New England Corps of Engineers, Waltham, Mass. DA CW33-68-C-0140
- 27-Western Electric, New York, N.Y. \$1,117,200. Nike Hercules improved kits. Burlington, NC Army Missile Command, Huntsville, Ala. DA AH01-67-A-0028
- Vtro Corp., Fort Walton Beach, Fla. \$1,200,000. Vehicle acquisition and tracking system. Dugway Proving Ground, Utah. DA AD09-68-C-0090
- V&N Construction Co., Lubbock, Tex. \$2,844,819. Construction of an academic building at Fort Sill, Okla. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0106
- Aerojet General, Sacramento, Calif. \$1,463,200. Hawk rocket motors. Nimbus, Calif. Army Procurement Agency, Oakland, Calif. DA AG05-67-C-1000
- FMC Corp., San Jose, Calif. \$1,849,450. Production engineering in support of the M113A1 full-tracked self-propelled vehicle. Army Procurement Agency, Oakland, Calif. DA 04-200-AMC-02920
- Collins Radio Co., Cedar Rapids, Iowa \$1,437,347. Direction finder sets and various components for installation in aircraft. Electronics Command, Fort Monmouth, N.J. DA AB05-68-A-0304
- ITT Gilfillan, Inc., Los Angeles, Calif. \$2,207,945. Parts qualification test program, reliability program, and spare parts for the directional mortar locating radar set AN/TTC-28. Electronics Command, Fort Monmouth, N.J. DA AB07-67-C-0146
- Christie Electric Corp., Los Angeles, Calif. \$2,072,520. Power supplies. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0434
- Electrospace Corp., Glen Cove, N.Y. \$1,669,260. Various searchlights and ancillary items. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0370
- Southern Airways Co., Sylacauga, Ala. \$4,725,000. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0277
- Emerson Electric, St. Louis, Mo. \$4,465,000. XM28 helicopter armament sub-systems. Army Weapons Command, Rock Island, Ill. DA AF03-68-C-0025
- Maremont Corp., Saco, Maine. \$1,538,080. M60 machine guns with spare barrels and bipod assemblies Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0087
- Mack Truck, Inc., Allentown, Pa. \$1,472,493. Vehicle repair parts. Tank Automotive Command, Warren, Mich. DA AF07-68-C-0872
- Mack Truck, Inc., Allentown, Pa. \$1,943,298. Engine assemblies for 5-ton trucks. Hagerstown, Md. Tank Automotive Command, Warren, Mich. DA AE07-68-C-3224
- Hercules Engines, Inc., Canton, Ohio. \$1,163,053. Repair parts for 14-horsepower standard military engines. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-8141
- Metric Systems Corp., Fort Walton Beach, Fla. \$1,110,030. Trestle assemblies for floating and fixed bridges. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-8368
- Irving T. Miller & Co., Burgetts Town, Pa. \$2,383,453. Work on the Charters Creek local protection project near Pittsburgh, Pa. Engineer Dist., Pittsburgh, Pa. DA CW59-68-C-0140
- International Harvester, San Diego, Calif. \$2,812,007. CH-47 helicopter auxiliary power units Aviation Materiel Command, St. Louis, Mo. DA 23-204-AMC-03921
- Bell Aerospace Corp., Fort Worth, Tex. \$1,393,936. UH-1 helicopter quill assemblies. DA AJ01-68-A-0022; \$2,667,398 UH-1 helicopter rotary wing blades. DA AJ01-68-A-0022; \$2,070,985. UH-1 helicopter scissors and sleeves. DA AJ01-68-A-0022 Aviation Materiel Command, St. Louis, Mo.
- Bendix Corp., Peterboro, N.J. \$1,899,693. Type MB-1 attitude indicators supporting multiple type aircraft. Aviation Materiel Command, St. Louis, Mo. DA AJ01-67-D-0106
- Boeing Co., Morton, Pa. \$6,082,435. CH-47 helicopter spare parts. DA AJ01-68-A-0005; \$8,200,215. CH-47 helicopter spare parts. DA AJ01-68-A-0005. Aviation Materiel Command, St. Louis, Mo.
- Physics International Co., San Leandro, Calif. \$2,409,012. Design development of the aurora transient radiation effects facility. Defense Atomic Support Agency. DA SA01-68-C-0175
- Avco Corp., Stratford, Conn. \$5,042,869. Special test equipment and special tooling to increase production capability for T53L13 turbine engines DA AJ01-68-C-1993; \$3,281,625. Pre-production effort to increase production capability for T53L13 engines DA AJ01-68-C-1876; \$9,000,000. Expansion of production facilities for T53L13 turbine engines. DA AJ01-68-C-1767; \$1,855,400. Repair of production facilities for T53L13 engines. DA AJ01-68-C-1767; \$46,157,550. T53L13 engines for Huey Cobra helicopters. DA AJ01-68-C-1874 Aviation Materiel Command, St. Louis, Mo.
- 28-Montgomery, Ross & Fisher, Los Angeles, Calif. \$13,158,000. Construction of an eight-story reinforced concrete hospital. Fort Ord, Calif. Engineer Dist., Sacramento, Calif. DA CA05-68-C-0111
- Mingnavox Co., Urbana, Ill. \$1,639,078. M18 gun direction computers. Army Procurement Agency, Chicago, Ill. DA AA25-68-C-0429
- Roberts Dredge, Inc., LaCrosse, Wis. \$1,069,834. Flood protection work along the Mississippi River near Canton, Mo. Engineer Dist., Rock Island, Ill. DA CW25-68-C-0057
- V&N Construction Co., Lubbock, Tex. \$1,047,320. Construction of an academic building with a fallout shelter at Fort Wolters, Tex. Engineer Dist., Fort Worth, Tex. DA CA63-68-C-0173
- Guyler Co., Lampasas, Tex. \$1,376,951. Construction of a personnel processing facility with air conditioning at Lackland AFB, Tex. Engineer Dist., Fort Worth, Tex. DA CA63-68-C-0176
- General Electric, Burlington, Vt. \$2,305,069. Spare parts for the Vulcan XM-163 weapons system. DA AG25-68-C-0866; \$2,317,780. 20mm air defense artillery guns. DA AG25-68-C-0751. Army Procurement Agency, New York, N.Y.
- Great Lakes Dredge & Dock Co., New York, N.Y. \$3,941,090. Construction of a hurricane flood protection project near Keansburg, N.J. Engineer Dist., New York, N.Y. DA CW61-68-C-0046

- Babcock Electronics Corp., Costa Mesa, Calif. \$3,490,000. Personnel target subsystem installation and testing. Army Procurement Agency, Oakland, Calif. DA AG05-68-C-0762.
- Dynalectron, Washington, D.C. \$1,150,000. Job data collection and related support service for operation of the White Sands Missile Range, N.M. White Sands Missile Range, N.M. DA 29-040-AMC-1505(R).
- Stewart Pacific, Inc., Seattle, Wash. \$1,988,974. Construction of a small boat harbor on the Kona Coast of Hawaii. Engineer Dist., Honolulu, Hawaii. DA CW83-68-C-0016.
- The Ammunition Procurement & Supply Agency, Joliet, Ill., has awarded the following 23 contracts:
- Firestone Tire & Rubber Co., Akron, Ohio \$7,520,470. Loading, assembling and packing ammunition and related components, and for operation of the Army Ammunition Plant, Ravenna, Ohio. DA 11-173-AMC-00065(A).
 - Chamberlain Mfg. Corp., Elmhurst, Ill. \$2,647,512. Production of 105mm cartridge cases Burlington, N.J. DA AA09-68-C-0305.
 - Mason & Hanger-Silas Mason Corp., Lexington, Ky. \$12,017,249. Production of bombs, mines, support services and operation of the Army Ammunition Plant, Grand Island, Neb. DA 11-173-AMC-00019(A).
 - Olin Mathieson Chemical Corp., New York, N.Y. \$8,263,365. Production of propelling charges. Charleston, Ind. DA 11-173-AMC-00097(A). \$1,770,400. Production of propellants and for support activities at the Army Ammunition Plant, Baraboo, Wis. DA 11-173-AMC-00106(A).
 - Federal Cartridge Corp., Minneapolis, Minn. \$20,471,361. Production of small arms ammunition and support services at the Army Ammunition Plant, New Brighton, Minn. DA 88-038-AMC-01099(A).
 - Hercules, Inc., Wilmington, Del. \$11,367,055. Manufacture of propellants and support services at the Army Ammunition Plant, Radford, Va. DA W-11-173-AMC-00087(A). \$14,095,014. Production of propellants, mixed acids and support services at the Army Ammunition Plant, Lawrence, Kan. DA 11-173-AMC-42A.
 - Atlas Chemical Industries, Wilmington, Del. \$3,031,015. Production of TNT and support services at the Army Ammunition Plant, Chattanooga, Tenn. DA 11-173-AMC-00531(A).
 - Sperry Rand Corp., New York, N.Y. \$26,959,751. Metal parts for projectiles: loading, assembling and packing ammunition and components; and support services at the Army Ammunition Plant, Shreveport, La. DA 11-173-AMC-00080(A).
 - Hamilton Watch Co., Lancaster, Pa. \$2,887,600. Fuzes for 105mm illuminating shells. East Petersburg, Pa. DA AA09-68-C-0593.
 - McGraw Edison Corp., Ingraham Industries Div., Bristol, Conn. \$3,856,140. 105mm and 4.2-inch projectile fuzes. DA AA09-68-C-02224.
 - Remington Arms Co., Bridgeport, Conn. \$25,315,569. Small arms ammunition and support services at the Army Ammunition Plant, Independence, Mo. DA 49-010-AMC-00003(A).
 - General Time Corp., Stamford, Conn. \$1,472,000. M565 mechanical time fuzes for 105mm and 4.2-inch illuminating shells. LaSalle, Ill. DA AA09-68-C-0223; \$3,400,188. M584 fuzes for 105mm and 4.2-inch mortar shells. Thomaston, Conn. DA AA09-68-C-0220.
 - General Motors, Detroit, Mich. \$15,737,246. Metal parts for 105mm projectiles. St. Louis, Mo. DA AA09-68-C-0066; \$14,503,636. Modernization and support activities for production of metal parts for 105mm projectiles. St. Louis, Mo. DA AA09-67-C-0025.
 - Norris Industries, Los Angeles, Calif. \$3,573,321. Metal parts for 81mm and 105mm cartridge cases. Riverbank, Calif. DA AA09-68-C-0304.
 - Columbus Milpar Mfg. Co., Columbus, Ohio. \$1,240,000. Metal parts for 81mm projectile fuzes. Columbus and Westerville, Ohio. DA AA09-68-C-0300.
 - Rulon Co., Chicago, Ill. \$2,070,000. Metal parts for M48A3 fuzes. DA AA09-68-C-0296.
 - Thiokol Chemical Corp., Bristol, Pa. \$35,151,301. Production and loading, assembling and packing mortars, rocket motors, igniters, and other miscellaneous ammunition. Marshall, Tex. DA 11-173-AMC-00200(A).
 - Holston Defense Corp., Kingsport, Tenn. \$1,215,227. Production of miscellaneous explosives and support activities at the Army Ammunition Plant, Kingsport, Tenn. DA W-11-173-AMC-00035(A).
 - Uniroyal, Inc., New York, N.Y. \$31,279,322. Production of explosives and for loading, assembling and packing of supplemental charges. Joliet, Ill. DA 11-173-AMC-00062(A).
 - Wilkinson Mfg. Co., Fort Calhoun, Neb. \$1,205,375. Metal parts for M52A5 fuzes. Army Procurement Agency, New York, N.Y. DA AA09-68-C-0308.
 - Diamond, Inc., Great Neck, N.Y. \$1,800,023. Construction of an incinerator for the New York Harbor Caven Point Terminal, N.J. Engineer Dist., New York, N.Y. DA CW61-68-C-0046.
 - Hamilton Watch Co., Lancaster, Pa. \$1,647,709. 105mm artillery fuzes. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0431.
 - Amron Corp., Waukesha, Wis. \$2,325,608. 20mm brass cartridge cases. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0360.
 - Emco Porcelain Enamel Co., Port Chester, N.Y. \$1,122,550. M2A1 metal ammunition boxes. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-8731.
 - White Motor Corp., Lansing, Mich. \$2,882,939. 2½-ton trucks. General Purpose Vehicles Project Manager, Warren, Mich. DA AE07-67-C-5819.
 - Kaiser Jeep Corp., Toledo, Ohio. \$1,595,986. Technical data package for M715 vehicles. DA AE06-68-C-0013; \$40,867,204. Five-ton trucks. South Bend, Ind. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0012.
 - Mack Trucks, Allentown, Pa. \$9,272,448. 198 diesel engines and one lot of concurrent repair parts. Hagerstown, Md. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0010.
 - Union Carbide Corp., New York, N.Y. \$3,262,500. Batteries for radio sets (AN/PRC 8, 9 and 10). Charlotte, N.C. Electronics Command, Philadelphia, Pa. DA AB05-68-C-2471.
 - RCA, Burlington, Mass. \$4,624,074. Two depot-installed Maintenance Automatic Test Equipment (DIMATE) and ancillary items. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0405.
 - Cutler-Hammer, Inc., Deer Park, N.Y. \$10,374,390. AN/PPS-5 radar sets and ancillary items. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0432.
 - Hallcrafters Co., Rolling Meadows, Ill. \$2,440,000. Ground support equipment for countermeasure sets (AN/ALQ-89 (XEN)). Electronics Command, Fort Monmouth, N.J. DA AB07-67-C-0262.
 - Harvard Industries, Farmingdale, N.Y. \$1,160,334. Radio sets (AN/GRC-50). Electronics Command, Fort Monmouth, N.J. DA AB05-68-C-0016.
 - Honeywell, Inc., St. Petersburg, Fla. \$1,000,000. Classified R&D. Electronics Command, Fort Monmouth, N.J.
 - Northrop Nortronics Corp., Palo Verde, Calif. \$5,487,544. AN/ASH-10 voice communications system and associated items for selected aircraft. Electronics Command, Fort Monmouth, N.J. DA AB06-68-C-0467.
 - Resdel Engineer Corp., Pasadena, Calif. \$1,174,909. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0427.
 - Raytheon Co., Norwood, Mass. \$4,615,000. Multiplexers and ancillary items. North Dighton, Mass. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0332.
 - H. B. Zachry Co., San Antonio, Tex. \$2,585,066. Work on the Fort Worth Floodway Project, Tarrant and Fort Worth Counties, Tex. Engineer Dist., Fort Worth, Tex. DA CW63-68-C-0146.
 - Warrior Constructors, Houston, Tex. \$1,000,500. Construction of three BO buildings at Randolph AFB, Tex. Engineer Dist., Fort Worth, Tex. DA CA63-68-C-0172.
 - Dairagh & Lyda, Inc., San Antonio, Tex. \$1,085,037. Construction of two service clubs at Lackland AFB, Tex. Engineer Dist., Fort Worth, Tex. DA CA63-68-C-0163.
 - Youngdale Construction Co., San Diego, Calif. \$1,402,282. Construction of a NCO Open Mess, an Officers Open Mess and an Exchange Sales Store at Tink AFB, Okla. Engineer Dist., Fort Worth, Tex. DA CA63-68-C-0165.
 - Avco Corp., Stratford, Conn. \$1,434,400. Six aircraft engine test stands. Charleston, S.C. Aviation Materiel Command, St. Louis, Mo. AF-41-608-87-A-3234.
 - Boeing Co., Morton, Pa. \$2,926,311. Transmission assemblies and spare parts for CH-47 helicopters. DA AJ01-68-0006; \$26,579,318. CH-47 helicopters. DA AJ01-68-C-0577. Aviation Materiel Command, St. Louis, Mo.
 - Bell Helicopter Co., Fort Worth, Tex. \$3,340,326. UH-1 rotary wing hubs. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
 - Clevite Corp., Freeport, Ill. \$1,427,231. BA-279/U dry batteries. Electronics Command, Philadelphia, Pa. DA AB06-68-C-2472.
 - The Tank Automotive Command, Warren, Mich., has awarded the 16 following contracts:
 - Kaiser Jeep Corp., Toledo, Ohio. \$1,533,154. Utility trucks. DA AE06-67-C-8236.
 - Hercules Engines, Inc., Canton, Ohio. \$9,089,498. Engine assembly installation for 2½-ton trucks. DA AE07-68-03181; \$1,051,540. Engine assembly installation for five-ton trucks. DA AE07-68-C-2234.
 - Miller Trailers, Inc., West Brantford, Fla. \$1,275,000. Six-ton semi-trail vans. DA AE07-68-C-8009.
 - Ford Motors, Wixom, Mich. \$1,150,000. Production engineering services for ¼-ton utility trucks and front line balance trucks. DA AE07-68-C-2998.
 - General Motors, Anderson, Ind. \$305,945. Storage batteries for use on tactical vehicles. Anaheim, Calif. DA AE07-68-C-3225.
 - General Motors, Indianapolis, Ind. \$231,920. Transmission assemblies with containers for M60A1 tanks. DA AE07-68-C-2806.
 - General Motors, Detroit, Mich. \$1,000,000. Advanced production engineering for the XM-70 Main Battle Tank. Warren, Mich. and Cleveland, Ohio. DA AE07-68-C-3097; \$1,562,892. Diesel engines for the M113 vehicle. DA AE07-68-C-0410.
 - Caterpillar Tractor Co., Peoria, Ill. \$1,773,500. Advanced production engineering for the VHO family of engines. DA AE07-68-C-2097.
 - International Harvester Co., Chicago, Ill. \$2,977,915. Air transport maintenance trucks. St. Louis, Mo. DA AE07-68-C-3246.
 - Chrysler Corp., Centerline, Mich. \$375,000. Advanced production engineering for XM746 truck tractors. DA AE07-68-C-2074.
 - FMC Corp., South Charleston, W. Va. \$5,585,233. M113 vehicles. DA AE07-68-C-0446; \$2,806,200. M113A1 vehicles. DA AE07-68-C-0446.
 - FMC Corp., San Jose, Calif. \$11,500,000. M113A1 vehicles. DA AE07-68-2340.
 - Continental Motors, Muskegon, Mich. \$5,336,029. Engine assemblies M48A31/M60A1 tanks. DA AE07-C-2734.
 - The Army Weapons Command, Ft. Island, Ill., has awarded the following six contracts:
 - Hughes Tool Co., Culver City, Ca. \$1,577,241. XM2E1 armament subassemblies for the OH-6A helicopter. DA AF08-68-C-0076.
 - Colt's, Inc., Hartford, Conn. \$1,418,638. 5.56mm magazine assemblies support the M16 family of weapons. DA AF08-68-C-0080.
 - General Motors, Cleveland, Ohio. \$850,864. 155mm howitzers. DA 199-AMC-000610(W).

Electric, Burlington, Vt. \$4.-
XM18E1 aircraft armament
1.62mm aircraft machine guns,
auxiliary equipment Burlington,
1 Springfield, Mass. DA AF03-
78.

Electric, Springfield, Mass. \$1.
M73E1 machine guns, final
out and test equipment, and
out repair parts. DA AF03-
86; \$2,032,635. M85 machine
inspection and test equipment,
assemblies, and bolt assem-
A AF03-67-C-0039.

gh Products, Red Lion, Pa. \$1.-
Metal parts for 152mm pro-
Pleatiny Arsenal, Dover, N.J.
-88-C-1110.

c., Washington, D.C. \$1,000,000.
1 technical data systems for the
helicopter. Hairy Diamond
lea, Washington, D.C. DA
MC-00824(X).

ny Missile Command, Hunts-
t., has awarded the following
acts:

ell Douglas Corp., Titusville,
5,500,000. Production engineer-
production of Dragon anti-
son system. DA AH01-68-

Burlington, Mass. \$7,376,885.
ts of LCSS (land combat sup-
t) and engineering support for
ion and for technical publica-
DA AH01-68-C-2041.

Aircraft, Culver City, Calif.
00. TOW industrial engineer-
vices. DA AH01-68-C-2155.

ell, Inc., Hopkins, Minn. \$2.-
Shillolagh guidance set com-
DA AH01-68-C-2092.

Inc., Dayton, Ohio \$1,502,757.
h rocket launchers. DA AH01-
80.

eronautical Co., San Diego, Calif.
55. Maintenance and flight op-
s services for the MQM-84D
Target Missile Drone. Dana Ana
McGregor Ranges, N.M. DA
8-C-0003.

in Co., Andover, Mass. \$1,177.-
aintenance and modification of
tooling and test equipment for
wk missile system. DA AH01-68-

ell Douglas Corp., Santa
Calif. \$6,500,000. Research &
ment. RA-AH01-68-C-1237.

l. McKee Construction Co., El
x. \$5,193,200. Construction of
cks and two mess halls at Fort
Colo. Engineer Dist., Omaha,
GA45-68-C-0081.

merican Rockwell Co., Anaheim,
400,000. Army Materiel Com-
minal data configuration man-
system. Frankford Arsenal,
hia, Pa. DA 36-038-AMC-

Zimmerman, Inc., Philadelphia,
2,900. Loading, assembling and
miscellaneous ammunition, com-
and support services at the
ammunition Plant, Texarkana,
munition Procurement & Sup-
ply, Joliet, Ill. DA 11-178-
14(A).

ility Equipment Command, St.
Co., has awarded the following
acts:

ntal Motors, Muskegon, Mich.
383. Three and six horsepower
d military gas engines. DA
AMC-00808(T).

Har Tractor Co., Peoria, Ill.
112. 75 diesel engine driven
s. DA AK01-68-C-8147; \$1,043.-
Tractors. DA AK01-67-C-1864.
Corp., Bolmar, N.J. \$2,210.-
100 expandable shelters. DA
18-C-4237.

Mfg. Co., Los Angeles, Calif.
100. 50 expandable shelters.
k, Calif. DA AK01-68-C-4236.
nstrument Corp., Dallas, Tex.
3. HYL-3 and -4 TSEC regen-
erators (tactical) and U383/YR
upply adapters. Electronics Com-
ort Monmouth, N.J. DA AB07-
7.

Butt & Head, Inc., Dayton,
10,374,097. Construction of an
science laboratory at Wright-
AFB, Ohio. Engineer Dist.,
s, Ky. DA-CA27-68-C-0057.



DEPARTMENT OF THE NAVY

3-DeLaval Turbine Inc., Trenton, N.J.
\$10,789,956. Nuclear submarine propul-
sion machinery, including turbines,
gears, generators, motors and condens-
ers. Naval Ship Systems Command.
N00024-68-C-5410.

-Dyson & Co., Pensacola, Fla. \$2,366.-
420. Construction of BOQ at Naval Air
Station, Pensacola, Fla., and a BOQ
addition at Naval Auxiliary Air Sta-
tion, Sausley Field, Pensacola, Fla.
Southeast Div., Naval Facilities Engi-
neering Command, Charleston, S.C.

-Philco-Ford Corp., Palo Alto, Calif.
\$1,819,881. Operation and maintenance
of test sites for data acquisition and
data reduction at the DOD joint para-
chute test facility, El Centro, Calif.
Navy Purchasing Office, Los Angeles,
Calif. N00123-68-C-1091.

-Edgington Oil Refinery, Long Beach,
Calif. \$1,563,678. Asphalt petroleum.
Navy Purchasing Office, Los Angeles,
Calif. N00123-68-D-2276.

-Akwa-Downey Construction, Milwaukee,
Wis. \$1,469,740. Construction of bar-
racks at the Naval Training Center, Or-
lando, Fla. Southeast Div., Naval Faci-
ties Engineering Command, Charleston,
S.C. NBY-84088.

-Grumman Aircraft Engineering Corp.,
Bethpage, N.Y. \$1,400,000. A-8A mod-
ernization study. Naval Air Systems
Command. N00019-68-C-0058.

-General Signal Corp., Woodbury, N.Y.
\$1,162,377. Radar equipment. Naval air
Systems Command. N00019-68-C-0288.

-Hughes Aircraft, Culver City, Calif.
\$1,002,378. Aircraft launchers. Naval Air
Systems Command. N00019-68-C-0160.

4-Grumman Aircraft Engineering Corp.,
Bethpage, N.Y. \$19,230,300. Modification
kits for the E-2A program. Naval Air
Systems Command. N00019-67-C-0057.

-Hughes Aircraft, Culver City, Calif.
\$3,923,000. Phoenix missile system (in-
creased limitation of authorization).
Tucson, Ariz. and Culver City, Naval
Air Systems Command. N00019-68-C-
0295.

-Boeing Co., Morton, Pa. \$2,470,057.
CH-46D helicopters. Naval Air Systems
Command. N00019-67-C-0255.

-Raytheon Co., Lowell, Mass. \$1,213,827.
Guidance and control groups for Chapar-
rail missiles for the Army. Naval Air
Systems Command. N00019-68-C-0323.

-Simplex Wire & Cable Co., Portsmouth,
N.H. \$1,760,000. 488 nautical miles of
submarine cable. Naval Electronic Sys-
tems Command. N00039-68-C-3609.

-ITT Corp., Nutley, N.J. \$1,690,440.
Manufacture of AN/URN-20 TACAN
beacons. Naval Electronic Systems
Command. N00039-C-2568.

5-Western Electric, New York, N.Y. \$5.-
324,175. Classified work. Whippany, N.J.
Naval Electronic Systems Command
N00039-68-C-8584.

-Hazeltime Corp., Little Neck, N.Y. \$8.-
105,736. Airborne interrogator sets.
Naval Air Systems Command. N00019-67-
C-0656.

-Akwa-Downey Construction Co., Milwau-
kee, Wis. \$3,210,007. Construction of
recruit barracks at the Naval Training
Center, San Diego, Calif. Southwest Div.,
Naval Facilities Engineering Command,
San Diego, Calif. N62473-67-C-3077.

-Philco-Ford Corp., Willow Grove, Pa.
\$1,241,820. Ten militarized card punches.
Naval Ship Systems Command. N00024-
68-C-1249.

-Lasko Metal Products, West Chester,
Pa. \$1,023,006. Zuni Rocket launchers.
Navy Ships Parts Control Center, Me-
chanicburg, Pa. N00104-68-C-5373.

6-McDonnell Douglas Corp., St. Louis, Mo.
\$248,130,000. F-4E aircraft. Naval Air
Systems Command. N00019-68-C-0495.

-United Aircraft, Hartford, Conn. \$25.-
378,990. J-52 P-8A engines. Naval Air
Systems Command. N00019-67-C-0182.

-Westinghouse Electric, Baltimore, Md.
\$2,145,000. Rigid antennas for AN/TPS-
22A radar sets. Marine Corps Headquar-
ters.

7-Whittaker Corp., Columbus, Ohio. \$10.-
135,377. MK 16, MOD 1, bomb fins. Navy
Ships Parts Control Center, Mechanics-
burg, Pa. N00104-68-C-5308.

-RCA, Van Nuys, Calif. \$8,053,647.
Classified electronic countermeasure sys-
tems, repair parts, engineering services,
and training and technical data. Naval
Ship Systems Command N00024-68-C-
1302.

-Collins Radio Co., Cedar Rapids, Iowa.
\$5,008,972. Airborne communication, nav-
igation and identification systems and
related equipment. Naval Air Systems
Command. N00019-67-C-0658.

-Magnavox Co., Fort Wayne, Ind. \$1,263,
040. Classified electronic countermeasures
equipment. Naval Air Systems Com-
mand. N00019-68-C-0280.

-CWC Associates, Uniondale, N.Y. \$1,130.-
000. Rehabilitation of barracks at the
Naval Construction Battalion Center,
Davisville, R.I. Northeast Div., Naval
Facilities Engineering Command, Boston,
Mass. NBY-83548.

10-Christensen Raber Klef & Associates, and
B-E-C-K Constructors, Seattle, Wash.
\$4,384,700. Construction of family hous-
ing units at the Naval Air Station,
Whidbey Island, Oak Harbor, Wash.
Northwest Div., Naval Facilities Engi-
neering Command, Seattle, Wash. NBY-
84879.

-Corbetta Construction Co., Des Plaines,
Ill. \$3,997,000. Construction of 200
housing units at the Naval Training
Center, Great Lakes, Ill. Midwest Div.,
Naval Facilities Engineering Command,
Great Lakes, Ill. NBY-83704.

-American Mfg. Co. of Tex., Fort Worth,
Tex. \$3,187,560. MK 41, MOD 0, pro-
jectiles for 5"/54-cal. ammunition. Navy
Ships Parts Control Center, Mechanics-
burg, Pa. N00104-68-C-5403.

-United Aircraft, Stratford, Conn. \$1,930-
000. Design, development, and construc-
tion of a prototype assault support patrol
boat. Naval Ship Systems Command.
N00024-68-C-0349.

11-Volpe Construction Co., Washington, D.C.
\$5,987,000. Construction of a chemistry
laboratory at the Naval Research Labora-
tory, Washington, D.C. Chesapeake Div.,
Naval Facilities Engineering Command,
Washington, D.C. NBY-86238.

-Intercontinental Mfg. Co., Garland, Tex.
\$1,969,716. MK 84, MOD 2, bomb bodies
for 2,000-pound bombs. Navy Ships Parts
Control Center, Mechanicsburg, Pa.
N00104-67-C-0074 MOD P024.

-ITT Corp., Nutley, N.J. \$1,774,558.
Manufacture of AN/GRN-9D equipment.
Naval Electronic Systems Command.
N00039-68-C-2563.

-Timmons, Butt & Head, Inc., Columbus,
Ohio. \$1,762,342. Construction of an ad-
dition to the instrument overhaul shop
at the Newark Air Force Station, Ohio.
East Central Div., Naval Facilities
Engineering Command, Philadelphia, Pa.
NBY-83622.

-Perini Corp., Boston, Mass. \$1,291,290.
Extension of pier one at the Newport,
R.I., Naval Station. Northeast Div.,
Naval Facilities Engineering Command,
Boston, Mass. NBY-83565.

-Shadrick & Wood, Inc., Farmville, Va.
\$1,008,338. Rehabilitation of the BOQ
at the Norfolk, Va., Naval Air Station.
Atlantic Div., Naval Facilities Engi-
neering Command, Norfolk, Va. NBY-88272.

12-Defoe Shipbuilding Co., Bay City, Mich.
\$14,253,314. Twenty-two LCU's. Naval
Ship Systems Command. N00024-68-C-
0336.

-Clevite Corp., Cleveland, Ohio. \$7,450.-
000. Engineering studies to develop MK
48, MOD 1, torpedoes, and fabrication
and testing of prototype models. Naval
Ordnance Systems Command. N00017-67-
C-1206.

-Cardwell Mfg. Co., Wichita, Kan. \$4.-
687,799. Sixteen minesweeping systems,
including cranes, power supplies, remote
control systems, winches and cable reels.
Naval Ship Systems Command. N00024-
68-C-5405.

-Johns Hopkins University, Applied Phys-
ics Laboratory, Silver Spring, Md. \$3.-
955,685. Project Bumblebee R&D. Naval
Ordnance Systems Command. N0W 62-
0604C.

-Scripps Institution of Oceanography, La
Jolla, Calif. \$3,338,556. Oceanographic
research. Office of Naval Research.

- Sundstrand Corp., Rockford, Ill. \$1,335,591. Constant speed drives and quick attach-detach kits and associated spares for installation in A-7 aircraft. Naval Air Systems Command. N00019-68-C-0088.
- Stromberg-Carlson Corp., San Diego, Calif. \$3,742,708. Tactical display systems. Naval Air Systems Command. N00019-68-C-0253.
- J. B. Denny Jr., Norfolk, Va. \$1,499,040. Construction of an electronic accessories overhaul building at the Naval Air Station, Norfolk, Va. Naval Facilities Engineering Command. NBY-88512.
- FTS Corp., Denver, Colo. \$1,259,135. Wings for Sidewinder missiles. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0632.
- ESB, Inc., Raleigh, N.C. \$1,003,228. \$1,054,800. Production of MK 46, MOD 1 and MK 53, MOD 0, batteries. Naval Ordnance Systems Command. N00017-68-C-1431 and N00017-68-C-1432.
- 13—Associated Aero Science, Inc., Torrance, Calif. \$3,493,575. Processing, analyzing, and evaluating technical data for the Naval Weapons Center, China Lake, Calif. Ridgecrest, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-1223.
- United Aircraft, Stratford, Conn. \$1,100,000. HH-3F helicopters for the Coast Guard. Naval Air Systems Command. N00019-67-C-0141.
- 14—Bunker-Ramo Corp., Silver Spring, Md. \$5,011,828. Work on ECM equipment. Naval Air Systems Command. N00019-68-C-0210.
- General Precision Systems Inc., Little Falls, N.J. \$2,028,000. Equipment pertaining to the inertial measurement system, a navigational component of A-7E aircraft. Navy Aviation Supply Office, Philadelphia, Pa. N00383-68-A-3201-0015.
- B. F. Diamond Construction Co., Inc., Savannah, Ga. \$1,195,150. Extension of Pier 21 at the Naval Station, Norfolk, Va. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. NBY-88344.
- 17—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. \$8,000,000. EA-6B aircraft. Naval Air Systems Command. N00019-67-C-0078.
- Dynalectron Corp., Washington, D.C. \$1,463,754. Collection, processing and reduction of technical data as required by the Pacific Missile Range, Point Mugu, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-0573.
- United Aircraft Corp., E. Hartford, Conn. \$1,058,851. Hand tools for maintenance of TF-30 engines used in F-111 aircraft. Navy Aviation Supply Office, Philadelphia, Pa. N00383-68-69000A-AF372.
- Meadow Gold Dairies, Honolulu, Hawaii. \$1,000,191. Dairy products. Naval Supply Center, Pearl Harbor, Hawaii. N00604-68-C-0543.
- 18—United States Steel Corp., Pittsburgh, Pa. \$15,471,000. Mk 82, MOD 1, bomb bodies Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5408.
- IBM Corp., Washington, D.C. \$1,052,601. Form DD1348, a single line item requisition document. Navy Purchasing Office, Washington, D.C. Greenville, Ind., and Sherman, Tex. N00600-68-D-1477.
- Dorne and Margolin, Inc., Bohemia, N.Y. \$1,008,331. 1,619 VHF Log Periodic Antennae (AS-2236/GRC). Headquarters, Marine Corps.
- 19—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. \$11,919,000. Development of the E-2A/AFS-111 weapon system. Naval Air Systems Command. N00019-68-C-0542.
- McLean Contracting Co., Inc., Baltimore, Md. \$2,097,000. Extension of wharf Alpha at the Naval Weapons Station, Charleston, S.C. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. NBY-70993.
- Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. \$2,749,816. Evaluation of the functional feasibility of a multi-sensor detection and attack system in an R&D flight test vehicle. Naval Air Systems Command. N00019-68-C-0065.
- Teledyne Corp., Berwick, La. \$1,441,688. Design, development and construction of prototype assault support patrol boat (ASPB). Naval Ship Systems Command. N00024-68-C-0350.
- B&G Constructors, Inc., Santa Ana, Calif. \$1,222,701. Construction of aircraft maintenance shops at the Marine Corps Air Station, El Toro, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3155.
- William E. Arnold Co., Jacksonville, Fla. \$1,928,000. Rehabilitation of barracks at the Naval Air Station, Jacksonville, Fla. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. NBY-86103.
- 20—Ball Brothers Research Corp., Boulder, Colo. \$1,150,000. Design and development of an Apollo telescope mount and associated equipment. Office of Naval Research.
- Thomas W. Yoder Co., Inc., Rockville, Md. \$1,111,111. Construction of an addition to the Intelligence Center, Naval Scientific and Technical Center, Suitland, Md. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. NBY-84651.
- 21—Western Electric Co., New York, N.Y. \$9,356,808. Oceanographic research material. Naval Electronic Systems Command. N00039-68-C-3608.
- North American Rockwell Corp., Anaheim, Calif. \$1,277,754. Design, development, and fabrication of two acoustic source antennae for the Navy's Acoustic Communication Program. Columbus, Ohio, and Los Angeles, Calif. Navy Purchasing Office, Brooklyn, N.Y. N00140-68-C-0549.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,143,101. Implementation of a study to develop the most effective complement of maintenance equipment for support of attack aircraft aboard aircraft carriers. Naval Air Engineering Center, Philadelphia, Pa. N00156-68-C-2318.
- 24—Lockheed Missiles & Space Co., Sunnyvale, Calif. \$5,000,000. Test support in the development of the Sentinel system. Special Projects Office. N00030-68-C-0303.
- Harrison Overseas Corp., Miami, Fla. \$4,273,000. Construction of barracks at the Naval Station, and at the Naval Air Station, Guantanamo Bay, Cuba. Caribbean Div., Naval Facilities Engineering Command, San Juan, Puerto Rico. NBY-84202.
- Interstate Electronics Corp., Anaheim, Calif. \$3,541,542. Poseidon missile test instrumentation. Special Projects Office. N00030-68-C-0207.
- AAT Corp., Cockeysville, Md. \$2,568,685. Automatic testing equipment system for testing aircraft engines. Naval Supply Center, Norfolk, Va. N00189-68-C-0838.
- Kauai Builders Ltd., Lihue, Kauai, Hawaii. \$1,890,534. Construction of communication facilities and additions to the operations control building, missile assembly facility, radar maintenance shops, and telemetry facility at the Pacific Fleet Tactical Range, Barking Sands, Kauai, Hawaii. Pacific Div., Naval Facilities Engineering Command, Honolulu, Hawaii.
- Western Gear Corp., Lynwood, Calif. \$1,597,800. Diesel engine driven propelling units used for propelling pontoons. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-1897.
- 25—Admiral Corp., Chicago, Ill. \$3,925,505. Radio sets for aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-3380.
- Youngdale Construction Co., San Diego, Calif. \$1,847,000. Construction of barracks and a mess hall at the Naval Submarine Support Facility, Ballast Point, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62469-67-C-3080.
- Uniflite, Inc., Bellingham, Wash. \$1,365,105. Motor whaleboats (28 foot). Naval Ship Systems Command. N00024-68-C-0339.
- Sanders Associates, Nashua, N.H. \$1,180,000. Design, development and fabrication of an airborne sensor operator display system and airborne tactical coordinator display system for carrier-based anti-submarine warfare aircraft, and supporting items. Navy Air Development Center, Johnsville, Pa. N62269-68-C-0475.
- Ingalls Shipbuilding Corp., Pascagoula, Miss. \$1,074,185,000. Construction of three nuclear-powered attack submarines. Naval Ship Systems Command. N00024-68-C-0242.
- General Dynamics, Groton, Conn. \$10,416,500. Construction of three nuclear powered attack submarines. Naval Ship Systems Command. N00024-68-C-0243.
- 26—Johns Hopkins University Appl. Physics Laboratory, Silver Spring, Md. \$4,822,400. Continued research and development in connection with various missiles. Naval Ordnance Systems Command. N0062-62-0604c.
- Perlin Co., Newport News, Va. \$2,230,070. Construction of barracks at the Naval Station, Norfolk, Va. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. NBY-93375.
- Condec Corp., Old Greenwich, Conn. \$628,511. Missile cradles for Sparrow and Shrike missiles. Niskayuna, N.Y. Navy Ordnance Laboratory, White Oak, Md. N60921-68-C-0890.
- 27—Sanders Associates, Nashua, N.H. \$1,000,000. Electronic equipment. Naval Air Systems Command. N00(A)66-0356.
- Magnavox Co., Fort Wayne, Ind. \$2,631,701. Sonobuoys and related equipment. Naval Air Systems Command. N00019-68-C-0591.
- Raytheon Co., South Lowell, Mass. \$1,075,248. Guidance and control groups for Chapparral missiles for the Army. Navy Air Systems Command. N00019-68-C-0102.
- American Machine & Foundry Corp., York, Pa. \$1,852,786. 600-lb. bomb bodies Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-C-0715.
- Lockheed Missile & Space Co., Sunnyvale, Calif. \$12,592,743. Polaris field engineering support. Special Projects Office. N00030-68-C-0083.
- Westinghouse Electric, Washington, D.C. \$11,852,500. Poseidon launcher equipment. Sunnydale, Calif. Special Projects Office. N00030-68-C-0218.
- Westinghouse Electric, Baltimore, Md. \$3,250,000. APD-7 side-looking radar systems for use on RA5C aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-6000A-AA.
- General Dynamics, San Diego, Calif. \$1,300,000. Radar sub-system for the A2 ASB-12 bomb navigational system. Aviation Supply Office, Philadelphia, Pa. N000383-68-C-3885.
- John C. Grimberg Co., and Seal & Co. Rockville, Md. \$1,672,000. Rehabilitation and extension of utilities at the Nav. Academy, Annapolis, Md. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. NBY-75563.
- Symmetries Engineering Corp., Satellite Beach, Fla. \$1,275,000. Telemetry antenna systems for the Pacific Missile Range Point Mugu, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-1833.
- Oberg Construction Corp., Northridge, Calif. \$1,146,000. Construction of a aircraft parking apron at the USM Air Station, El Toro, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3814.
- 28—R. F. Communications, Inc., Rochester, N.Y. \$1,854,612. Manufacture of AN VRT-23 radio transmitters. Naval Electronic Systems Command. N00039-68-C-1584.
- United Aircraft, Stratford, Conn. \$1,469,097. Modification of the CH-53 dynamometer system to provide a capability to retrieve H-53 helicopters and other tactical aircraft. Naval Air Systems Command. N00019-68-C-0602.
- North American Rockwell Corp., Anaheim, Calif. \$1,635,000. Components of the AN/ASB12 bomb navigational system for RA5C aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-67-A-5502-0270.
- Lusardi Construction Co., Vista, Calif. \$1,827,000. Construction of a combat vehicle maintenance shop and battle tactical maintenance shops at Camp Pendleton, Calif. Naval Facilities Engineering Command. N62473-67-C-3083.
- Merando, Inc., Washington, D.C. \$2,477,400. Construction of barracks at the Naval Air Test Center, Patuxent River, Md. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. NBY-94635.
- Lansdowne Steel & Iron Co., Morton, Pa. \$8,162,000. 5-inch 38-Caliber gun projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5481.

erlean Mfg. Co., Fort Worth, Tex 439,487. 5-inch, 54-caliber gun projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-2.

rris Industries, Los Angeles, Calif. 402,253. Steel cartridge cases for 5-b. 38-caliber and 54-caliber projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5460.

ies Construction Co., Memphis, Tenn. 870,000. Construction of barracks at Naval Air Station, Memphis, Tenn. Southwest Div., Naval Facilities Engineering Command, Charleston, S.C. F-88769.

ntel Construction Corp., San Francisco, Calif. \$2,972,000. Construction of barracks at the Naval School Command, Naval Station, Treasure Island, San Francisco, Calif. Western Div., Naval Facilities Engineering Command, San Francisco, Calif. NBY-85440.

neywell, Inc., West Covina, Calif. 300,462. ASW training device. 2211, with data and support. Naval Training Device Center, Orlando, Fla. 1330-68-C-0806.

illed Devices Corp., College Point, N.Y. \$1,066,614. Carrier control approach radar, repair parts, engineering services, a training course, and technical documentation. Naval Ship Systems Command, N00024-68-C-1354.

urity Construction Co., Richmond, Va. 577,000. Rehabilitation of Sampson Hall at the Naval Academy, Annapolis, Md. Naval Facilities Engineering Command, NBY-84572.

odyear Tire & Rubber Co., Akron, Ohio. \$1,350,827. Twenty-five tactical field fuel dispensing systems. Marine Corps Headquarters, M00027-68-C-0221.

dition and verification program. Norton AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0170.

Raytheon Co., Bedford, Mass. \$1,075,000. Development work on a radar guidance system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1586.

12-Litton Systems, Woodland Hills, Calif. \$1,062,125. Repair of components of the inertial navigation system applicable to F-4 aircraft. F04606-68-A-1047, \$4,455,887. Production of spare parts to support a stellar inertial navigation system applicable to RC-135 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606-68-A-1047.

Sperry Rand Corp., Salt Lake City, Utah. \$2,095,999. Production of airborne and ground radar systems. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34600-68-A-2268.

13-General Electric, Utica, N.Y. \$1,018,547. Production of radar space parts. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F0603-68-C-2632.

Ryan Aeronautical Co., San Diego, Calif. \$1,020,200. Maintenance and operation of the drone control facility at Tyndall AFB, Fla. Tyndall AFB, Fla. F03637-68-C-0178.

14-Philco-Ford Corp., Palo Alto, Calif. \$1,499,046. Work on a satellite control facility. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04801-68-C-0209.

Santa Fe Engineers, Lancaster, Calif. \$1,806,000. Construction of a re-entry system assembly surveillance and inspection building and associated munitions handling and storage for Minuteman Wing III at Malmstrom AFB, Mont. Corps of Engineers, Ballistic Missile Construction Office, DACA 18-68-C-6004.

17-Lockheed Aircraft Corp., Marietta, Ga. \$3,800,000. Engineering, design and fabrication of center wing sections for C-130 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F0603-68-C-2530.

18-General Electric Co., West Lynn, Mass. \$7,372,000. T-64 turboshaft engines for HH-53 helicopters. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0458-P003.

Radiation Inc., Melbourne, Fla. \$1,000,000. Engineering and production of an airborne communications electronics system. Palm Bay, Fla. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628-68-C-0392.

19-Goodyear Aerospace Corp., Akron, Ohio. \$2,400,000. Design, fabrication and test of development models of an electro-optical area correlation terminal guidance system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1626.

North American Rockwell Corp., Columbus, Ohio. \$1,000,000. Development of the laser optical guidance integration concept. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-67-C-1589.

Litton Systems, Inc., Woodland Hills, Calif. \$4,298,400. Development of an airborne navigational system. Air Force Missile Development Center, Holloman AFB, N.M. F29600-68-C-0026.

20-Thiokol Chemical Corp., Huntsville, Ala. \$1,500,000. Production of solid fuel rocket motors. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0120.

Hughes Aircraft Co., Culver City, Calif. \$3,301,000. Production of components for AN/ALQ71 airborne countermeasure system. El Segundo, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F33615-68-C-1676.

McDonnell Douglas Corp., Long Beach, Calif. \$1,065,699. Production of components for aircraft bomb racks. Torrance, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F04606-67-A-1432.

Sanders Associates, Inc., Nashua, N.H. \$1,154,131. Manufacture of airborne countermeasure receiver subsystems (AN/ARD-18). Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0070.

21-Boeing Co., Renton, Wash. \$1,650,000. Aircraft technical data. Oklahoma Air

Materiel Area, (AFLC), Tinker AFB, Okla. F04606-67-A-0519-1A60.

24-Lear Siegler, Inc., Santa Monica, Calif. \$3,759,776. Flight control systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0031.

General Electric, West Lynn, Mass. \$24,730,153. Production of helicopter engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-1428.

Olth Mathieson Chemical Corp., East Alton, Ill. \$3,048,000. Production of engine starter cartridges for B-57 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1058.

Hughes Aircraft, Fullerton, Calif. \$1,003,331. Spare parts for prototype tactical air control operations centers. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F19628-67-C-0154.

25-Cessna Aircraft, Wichita, Kan. \$1,219,000. Engineering and modification services, spare parts and data for C-2A aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1224.

Boeing Co., Wichita, Kan. \$2,300,000. Modification kits for B-52 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F31601-68-C-4271.

McDonnell Douglas Corp., Santa Monica, Calif. \$1,999,190. Preparation of space boosters for launch site operations. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0136.

27-Centex Construction Co., Dallas, Tex. \$6,720,000. Construction of family housing units at Laredo AFB, Tex. Base Procurement Office, Laredo AFB, Tex. F4161-68-I-0429.

Carnegie-Mellon University, Pittsburgh, Pa. \$1,860,631. Research in electronic data processing equipment information processing. Air Force Office of Scientific Research, Washington, D.C. F44620-67-C-0058.

28-Fairchild Miller Corp., Crestview, Fla. \$1,212,180. Repair of major F-105 aircraft components. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F0603-68-C-0183.

Dynamics Corp. of America, Bridgeport, Conn. \$2,132,223. Production of M17 teen electrical generators. Pasco, Wash. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-D-0576.

I.B.M. Corp., Gathersburg, Md. \$3,000,000. Work on a large aperture seismic array experimental signal processing system. Washington, D.C. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F1962867-C-0198.

Borders Electronics Co., Medford, N.J. \$2,730,175. Production of electronic counter-measure equipment. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-C-1786.

Texas Instruments, Inc., Dallas, Tex. \$30,331,760. Development and production of an adverse weather aerial delivery system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1271.

North American Aviation, Anaheim, Calif. \$15,484,100. Production of depot maintenance equipment to support the Minuteman missile system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF04 (694) 587.

Reeve Aleutian Airways, Anchorage, Alaska. \$1,005,688. Transportation services. Military Airlift Command, F11626-68-D-0326.

Atlantic Research Corp., Alexandria, Va. \$1,908,680. Meteorological rockets for high altitude weather test programs. Gainesville, Va. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-68-C-3337.

Hayes International Corp., Birmingham, Ala. \$1,299,511. Services in the management and worldwide distribution of Air Force publications. Middle River, Md. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F23601-67-C-0853.

Lockheed Missiles & Space Co., Sunnyvale, Calif. \$3,500,000. Provision of equipment, supplies and services for space and missile programs. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0236.



DEPARTMENT OF THE AIR FORCE

Uco Ford Corp., Philadelphia, Pa. 269,860. Repair and test of airborne missile guidance systems. Warner Robins Materiel Area, (AFLC), Robins AFB, Ga. F0603-68-D-0802.

2K Corp., Palo Alto, Calif. \$4,565,000. Production of radar warning and ranging equipment. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F04606-67-A-1818.

General Electric, West Lynn, Mass. \$8,046, J-85 aircraft engines. F33657-C-1659-P004. \$19,988,600. Production of helicopter engines. F33657-67-C-1428-02. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Lighters, Chicago, Ill. \$1,490,459. Airborne transmitter components. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F31601-68-A-2015.

A. Burlington, Mass. \$1,209,375. Airborne electronics camera R&D. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-68-C-1617.

radex, Inc., Miami, Fla. \$2,644,839. overhaul of reciprocating aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D-6-0014.

rchild Miller Corp., Germantown, Md. \$18,628. Production of aerospace ground equipment in support of C-119 aircraft. St. Augustine, Fla. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-C-6183.

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illed Technology, Inc., Palo Alto, Calif. \$2,000,000. Production of radar receiving sets. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F3367-68-C-1302.

W. Inc., Redondo Beach, Calif. \$2,100,000. Development work on the Minuteman operational targeting, tape val-

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Top Rates to Top Men U.S. Navy Seabees Seek Best Builders

The U. S. Navy is issuing a new call for Seabees under its Direct Procurement Petty Officer Program. The direct procurement program provides an outstanding opportunity for skilled men to fulfill their military obligation while gaining increased experience in their trade.

Qualified volunteer civilian construction workers, regardless of race, creed, or national origin, can join the Seabees with advanced rates. Volunteers sign up at any Navy recruiting office for a Seabee 30-month tour of duty. At that time, they are given direct petty officer ratings, based on their qualifications.

Any man under 40 years of age, who has been a civilian constructionman apprentice for 24 months or has 24 months of experience, can enlist in the Seabees as a Petty Officer 3rd Class. A constructionman with 48 months training and experience (normally a journeyman) can be a Petty Officer 2nd Class. A more senior worker can be a Petty Officer 1st Class, if he has seven years experience including some at the foreman or master level. Workers with still greater experience can be rated as Chief Petty Officers.

The Seabee volunteer goes directly to the Construction Battalion Center at Gulfport, Miss. There he attends a special school studying his responsibilities as a Navy petty officer.

After a month at Gulfport, he is given leave before reporting for duty to one of three Construction Battalion Centers, at Gulfport, Davisville, R. I., or Port Hueneme, Calif. He receives further training and is assigned to a construction battalion. His battalion spends about eight months on a construction job overseas; returns to its home base for six months of further training and outfitting; then, deploys overseas for another eight-month tour of duty.

Seabee specialties are: builder, construction electrician, construction mechanic, equipment operator, engineering aid (surveyor-draftsman), steelworker, and utilities man. A Seabee works in his specialty; he gets 30 days paid leave annually; and his opportunities for promotion are excellent.

Army Constructing New Weapons Research Building

The U. S. Army has begun construction of a research building at Rock Island Arsenal, Ill., that will aid engineers in the development of new weapons.

The building will house the Army's first test device to simulate the motions of an armored vehicle or helicopter, and to measure the forces upon these vehicles as a result of firing weapons from them. The simulator will make possible faster and more economical development of armament for tanks, self-propelled artillery, armored vehicles and helicopters.

Army Weapons Command engineers and researchers will use the simulator to establish the dynamics of a vehicle, and to determine effects of a vehicle's movement through the air or over rough ground on the firing of its weapons. They will seek to discover how factors such as adverse vibrations affect a weapon's accuracy and sighting devices.

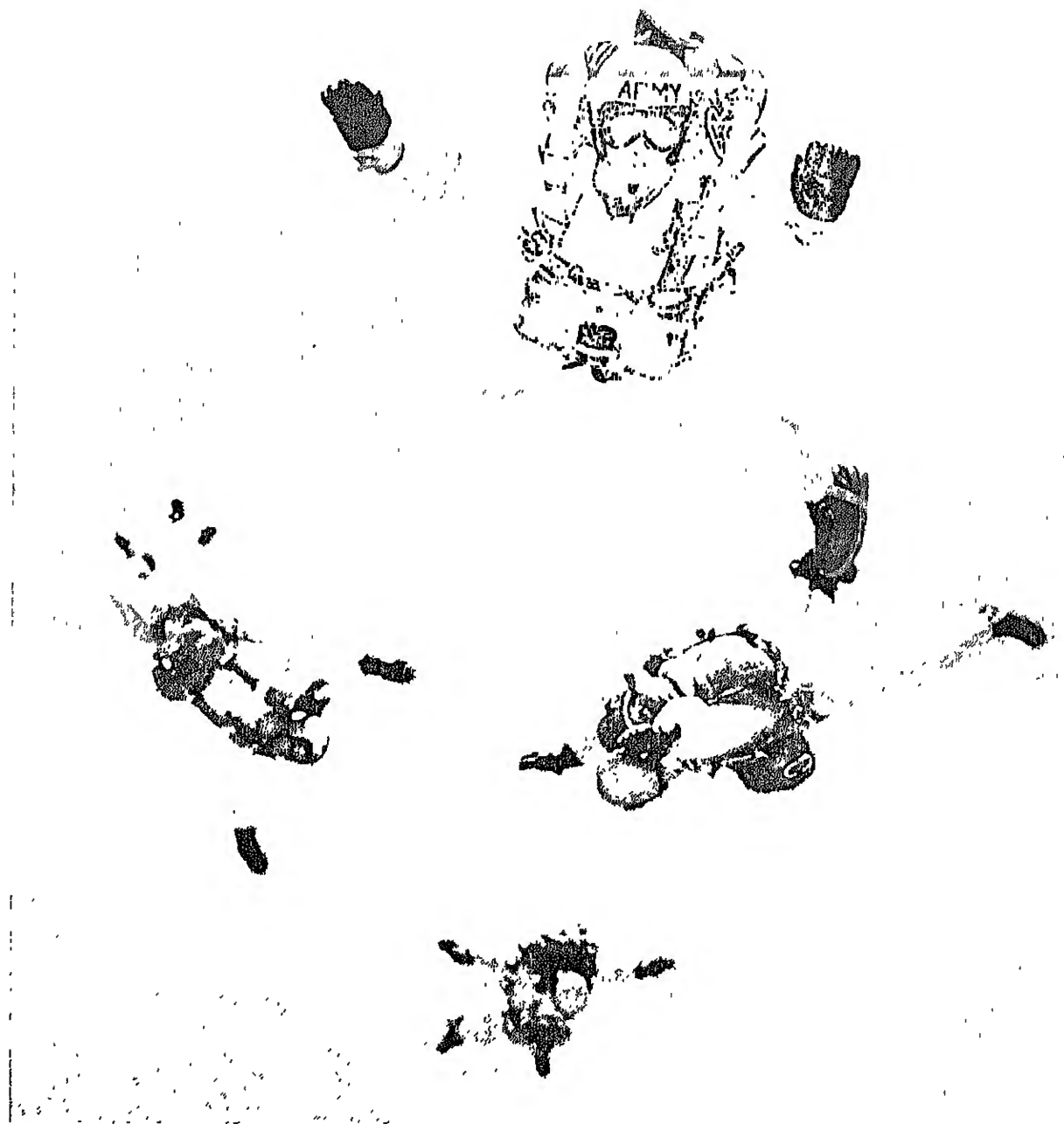
When the building is completed in July 1969, research will not be dependent upon weather conditions or upon availability of vehicles or crews.



DEFENSE INDUSTRY BULLETIN

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The Golden Knights

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

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About the Cover



Members of the Army Parachute Team, the Golden Knights, soar through the air in a free-fall exhibition. The team, formed in 1959, has produced five national champions and several world champions.

The Armed Services Board of Contract Appeals

George L. Hawkes

This article was prepared primarily for the benefit of contractors' administrators doing business with Defense Department and general legal practitioners who infrequently deal with defense contracts. The comments may also prove helpful to government contract administrators with limited experience in the disputes field. Simplifications and generalities should not mislead one into a false assumption that expertise in the field is unnecessary or lacking. Many eminent lawyers in private practice and in government service have devoted most of their careers to the field of government procurement, which has developed into a field of legal specialization with its own legal precedents and literature. This has been recognized by the American Bar Association which recently gave public contracts "section status" as a separate field of law. There always has to be a meeting ground between the layman and the expert based on infinite considerations, and it is to this area that this article is addressed.

Have you had problems lately with your defense contracts? Have the contracting officer and officials of your company been thinking on different wave lengths? Has there been a breakdown in communications? Have you wondered what an appeal under the disputes clause in that contract really means? Certainly the Secretary of the Service is too busy to give you the hearing to which the disputes clause entitles you. Therefore, probably you will have to exercise that contract privilege with the "duly authorized representative." That is the Armed Services Board of Contract Appeals.

This Board is composed of 28 members, all attorneys who devote their full time to hearing, considering and deciding appeals from decisions of contracting officers on disputed questions, where the contracting officer's decision was unacceptable to the contractor. The contracting officer's decision will recite your right to appeal the decision within 30 days, and it is this appeal, if made, which confers jurisdiction on the Board. The authority of the Board is essentially based on the terms of the contract and not derived from statute or other law. Each Board member receives his appointment from the four Assistant Secretaries

in charge of the procurement programs of the Army, Navy, Air Force and Defense Supply Agency. It should be noted that since the Board's authority derives from the terms of the contract, you must file that appeal within the time limit in the contract, namely 30 days.

Once the appeal is made, the rules promulgated by the Board govern the processing of the appeal. These rules are designed for the fair, orderly, expeditious and inexpensive processing of your appeal but are not considered jurisdictional, so that failure to comply with precision with a particular rule is not fatal to your rights. There is one exception. Motions for Reconsideration will not be considered unless filed within 30 days after receipt of the Board's original decision.

Whether you file your appeal with the contracting officer, the Secretary of the Service making the contract, or in some instances the Board, you will receive a notice of docketing and a copy of the Board's rules. These are mailed shortly after the appeal has been received in the Board's offices. The attorney designated by the Department to represent the Government will be notified at the same time. Sometimes after a brief review by the lawyers in the Department, the dis-

pute may be settled and that is the end of the problem. Most often, however, you will have to file a complaint in accordance with the Board's rules. The Government will file an answer and in this way it is hoped the differences can be clearly delineated and the issues joined.

Once the issues are joined, there are two ways to proceed. Sometimes there are few, if any, disputed facts in an appeal. In these cases the dispute is really about the legal conclusions to be derived from admitted facts. One often decides to submit this type of case on the record, possibly supplemented by affidavits and usually a brief setting forth your interpretation of the legal incidents which flow from the particular facts. The advantage to this system is a quicker decision, and it is appropriate where cross examination, confrontation of witnesses, and extensive oral examination are not necessary to establish the facts. The layman sometimes fears that election of this procedure may indicate to the opinion writer on the Board a lack of interest in the claim. This simply is not so.

More frequently the facts are not so clearly delineated. In these instances a hearing is available, necessary and, hopefully, helpful in clarifying oftentimes extremely complicated factual situations. This is the heart of the Board's proceedings. One afternoon a small contractor came into the office prior to his hearing scheduled for the next day. He asked the usual questions and I gave the usual answers about the hearing, its conduct, and what he might expect. Something deeper, however, was on his mind. He started to leave, and then returned and started to unload his troubled mind with a candor and certain lack of sophistication which I have often thought would have been the envy of many

others with a similar problem. Essentially he wanted to know if a little fellow really stood a chance up here in the Pentagon, with the Department of the Army represented by specialists in this field and the Board composed entirely of lawyers. Direct answers would have either generated false hope or added despair. He was far too astute to be satisfied with the bland facts often saved for moments like this—statistics. Finally I said, "All I can say is that we get about an equal number of complaints from appellants and from the "Government." This may appear awkward, but it is remarkable how close is the case and the particular litigant's feeling of the value or effectiveness of the tribunal that renders the decision. Nobody expects a person, who has developed strong feelings about his rights in a particular matter, to suddenly turn objective in his appraisal of a final administrative decision. We at the Board feel, however, that probably one of our successes has been to have a set of rules and be able to conduct hearings in a manner that can accommodate an appellant representing himself, a general practitioner, and lawyers who are specialists in the field of defense procurement.

Two things should be mentioned for those not familiar with a Board hearing. The hearing itself is often likened to a hearing before a judge without a jury. Formality vs. informality are often adapted to the circumstances, but informality should never be confused with carelessness. Second, the Board has built up a considerable body of contract and legal principles. Decisions have to be based on these principles. Often persons, who represent themselves, are prone to stress the so-called equitable factors or the unfairness of the situation in which they find themselves. Relief is granted as a matter of right and not as a matter of grace. Among many types of cases the Board has had to decide, several allege impossibility of performance under the specifications. This covers a substantial field of issues and answers, but even the layman must recognize that the key premise must be that the product cannot be made. Likewise, since the Board is a legally-oriented group, it may be necessary

to expand on the theme of why it is impossible to make the product in terms which can be understood by one who is not an authority in the particular technical field.

Subsequent to the hearing and after the parties have submitted legal briefs, the Board starts its consideration of the case and renders a decision based on the appeal record. This decision, usually drafted by the person who conducted the hearing, has to be reviewed by at least one more Board member and the Chairman and two Vice-Chairmen of the Board.

Sufficient for the mechanics of the Board. Where does it fit into the procurement picture of the Defense Department, and where does it stand as part of the appellant's exercise of his legal remedies? I have not seen any statistics recently about the number of procurement actions by the Defense Department but approximately 900 per year will entail a dispute sufficiently serious to generate an appeal. This must be a very gratifying figure to the Department because, by definition, a dispute means that there has been a breakdown in the orderly processes of the departmental procurement program. Certainly 900 is an infinitesimally small number in the overall procure-



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ment program, and even many of these disputes are settled prior to a hearing. The disputes run from a dandy little case involving \$4.50, which generated a split decision, to cases involving millions of dollars. Still other cases might not involve truly large sums of money, in themselves, but may affect many contracts involving the same issue. Some are of such magnitude to the individual company that they are literally a matter of economic life or death. In no accepted sense does the Board make departmental policy, but it frequently is the final interpreter within the defense establishment of regulations and contract provisions implementing that policy. Since the Board is independent in its determinations, its decisions are often reflected in departmental policy where later pronouncements agree with or modify that which was in existence at the time of an opinion's publication.

The exercise, or failure to do so, of your right to appeal may have a substantial bearing on future legal proceedings in a court of law. Essentially, decisions by the Board are final as to questions of fact if supported by substantial evidence in the record before the Board, but questions of law are reviewable *de novo* (i.e., without regard to the Board's holding) by the courts. An explanation of the difference between law and fact is purposefully avoided, as most issues involve a mixture of law and fact. The Board's work is recognized by the Wunderlich Act, May 11, 1954, Ch. 199, 68 Stat. 81 41; U.S.C. 321-322. It has been significantly recognized in three recent Supreme Court Decisions: *U.S. v. Bianchi*, 373 U.S. 709 (1963); *U.S. v. Anthony Grace & Sons, Inc.*, 384 U.S. 424; and *U.S. v. Utah Construction & Mining Co.*, 384 U.S. 394. If your attorney does not deal frequently with the specific field of government contracts, he might be interested in reviewing these cases which are accessible in law libraries.

The average case, which is processed through the Board, including a full hearing, takes approximately a year from the date of docketing to the date of decision. Like all averages it seldom applies to an individual case. You can, however, correlate this time with a case of average complexity. Of course, this

average does not include extensive pre-hearing procedures or other delays which may be necessary but often are not a part of the average case. Most procedures available in the courts are available to litigants before the Board. The Board does not itself have the power of subpoena. The subpoena can be used in very limited circumstances based on the U. S. Code, 5 U.S.C. 304(a). This is exercised very infrequently and involves a rather tedious legal process. In lieu, the Board will direct attendance of government employees on an adequate showing that they are necessary for the presentation of a contractor's case. In like manner, most discovery procedures available in the courts are also available before the Board.

Hopefully the foregoing gives a manager, administrator, or other responsible executive a rough idea of what he gets into when he decides to exercise his right to appeal under the disputes clause. The decision itself, I presume, has to be based on economic considerations but sometimes the principle involved outweighs the economics. Remember the \$4.50 case?

A vast majority of the disputes filed with the Board involve sums between \$1,000 and \$5,000, though several huge cases have increased the average claim to \$60,000. This latter figure, based on incomplete statistics, has almost doubled in the past six years.

The decision to appeal is the sole prerogative of the contractor, as the Government has no right of appeal. These decisions encompass a broad range of the defense production spectrum. At one time we had a run on toilet tissue cases. Surplus property cases sometimes develop humorous fact situations, not funny to the parties but opportunities to test a Board member's sense of humor while going about the most serious business of deciding a contractor's rights. Sweet potatoes offered a knotty legal problem. At the other end of the spectrum, sophisticated weaponry, complicated engineering problems, and involved accounting cases are frequently heard. As every other similar organization, however, the bulk of cases involve problems met frequently in

equipping a defense establishment of the magnitude of ours. Terminations for default, questionable workmanship, specifications not always clear, over-zealous inspections, under-zealous performance, tardy delivery are the same problems as you might have in building a house or other work for which one might personally contract. Simple, average, or sophisticated, the problem is solved by that special field of contract law known as government contracts.

Since the appeal is the contractor's, many comments herein have been addressed specifically to him; however, the Government (those representing the procuring department) otherwise has parallel or correlative rights. Unlike some government agencies which have organizations to assist the public, the Board assumes that people contracting to sell goods and services to the Defense Department have a certain degree of competency to deal with the Department. Under these circumstances it has, since at least the inception of the Board in its present form, assumed that the best way to the truth is through adversary proceedings.

Departmental counsel is paid to represent the Department, the Board to render an independent, impartial decision. Essentially this means that a general practitioner, or one representing himself, can present his case to the Board without fear of being bogged down in the mire of procedural queries. It does not mean he can expect the Department to make his case for him, or do other than put its best foot forward.

Eventually comes opinion time. It usually comes substantially sooner than most full court proceedings. If, even though cogent reasons are set forth in the decision of the Board, you are unhappy and dissatisfied with the result what recourse do you have? The Board is the final authority in the Defense Department. Now that you have exhausted your administrative remedy, you may bring an action in the U.S. District Court (if the claim is under \$10,000) or the U.S. Court of Claims. The Supreme Court citations given before may furnish some guide lines in considering that which is involved in turning from the administrative level to the

judicial branch of the Government for the relief you desire.

We on the Board hope, as I'm sure you do, that it does not become necessary for you to invoke the disputes procedure. But if you do, we trust that you will find your experience hardly the ogre you might have anticipated in the past. It is a device which has been exercised in its present form for 25 years.

We hope the experience will be enlightening and, if the final decision is not fruitful, at least you will feel that you have had the fair, courteous treatment to which you are entitled as an active associate of this country's defense establishment.

AUTODIN Modernization Contract Awarded

The Defense Communications Agency (DCA) has awarded a contract to the Western Union Telegraph Co. for the modernization of a portion of AUTODIN (Automatic Digital Network).

DCA awarded the contract through its Defense Commercial Communications Office (DECCO), Scott AFB, Ill., which will service the contract. It calls for estimated monthly recurring use charges of \$20,000,000 in the project, with the Radio Corp. of America and Control Data Corp. participating as subcontractors.

Work will include replacement of some equipment at all nine AUTODIN centers now being provided by Western Union.

Equipment to be installed will consist mostly of communications data processes, memory units and tape stations.

Completion of the modernization project will improve the operational efficiency, improve the reliability of operations, and will reduce power and air-conditioning requirements at each center.

The first site is scheduled for completion by Sept. 30, 1969, with the last site completed by March 15, 1971.

AUTODIN is a data transmission and switching network.

AUTODIN centers are located at Albany, Ga.; Andrews AFB, Md.; Fort Detrick, Md.; Gentile AFS, Ohio; Hancock AFS, N.Y.; McClellan AFB, Calif.; Norton AFB, Calif.; Tinker AFB, Okla.; and Wahiawa, Hawaii.

Output—

Closing the Management Loop

Lieutenant Colonel George B. Coe, USA

On May 24, 1966, President Johnson addressed a letter to all government departments and agencies in which he said: "I want every manager to think of his part of the total Government in terms of everything he owns, everything he owes and the full cost of doing every job *in relation to the products resulting from these costs*. I want him to think of minimal costs and cost reduction as profit. And I want him to think in terms of his profit as a result of how he uses all the resources entrusted to him. These goals cannot be fully achieved without sound financial management practices."¹

In response to the President's directive, Secretary of Defense McNamara on June 13, 1966, stated that "a new accounting structure is being designed, with accounts arranged so that they will provide information in the form needed (a) for programming, (b) for budgeting, and (c) to assist management in operations. This will permit the integration of the programming, budgeting, and management process." He further stated that "the focus will be on outputs and on resources used, that is on expense."²

On March 3, 1967, Secretary McNamara issued a memorandum to the heads of the major Defense Department components in which he said: "I am gratified by the progress. Much, however, remains to be done. In addition to the tasks of completing

¹ White House Memorandum, "Joint Financial Management Improvement Program," May 5, 1966. (Emphasis supplied).

² Secretary of Defense Memorandum, "Joint Financial Management Improvement Program" June 13, 1966. (Emphasis supplied).

the expense system for operations and developing an improved system for research and development, I want particular emphasis given to the development of improved ways to measure output."³

In a memorandum of March 16, 1967, Robert N. Anthony, Assistant Secretary of Defense (Comptroller), stated: "Expense accounting is only half the story, however. The other half is output data, a measurement of results achieved that can be matched with expenses incurred."⁴

On July 18, 1967, the Executive Office of the President issued Bureau of the Budget Bulletin Number 68-2 which requires the development of quantitative measures of end products or services, oriented to the structures like the Five Year Defense Program.⁵

Following the issuance of these requirements for development of improved measures of output as a function of resources consumed, the Assistant Secretary of Defense (Comptroller) took the lead by convening a preliminary joint study group, composed of representatives from the Military Departments and the Joint Chiefs of Staff, to identify the nature of the problems involved and recommend useful future actions. The preliminary study group met on

³ Secretary of Defense Memorandum, "Financial Management Improvements," March 3, 1967.

⁴ Assistant Secretary of Defense (Comptroller) Memorandum, "Financial Management Improvements," March 16, 1967.

⁵ Bureau of the Budget Bulletin 68-2, "Planning-Programming-Budgeting (PPB) System," Executive Office of the President, July 18, 1967. (Superseded by Bureau of the Budget Bulletin 68-9, April 12, 1968.)

May 24, 1967, and adjourned on May 31, 1967. The study group formulated a practical definition of the term "output measures" and concluded that: The Office of the Secretary of Defense (OSD) should identify the prospective users and uses of output measurement information, following which concurrent actions should proceed to identify the general characteristics of a fully adequate output measurement information system, and to determine what requirements would be imposed upon the Defense Department to provide and process the necessary information.

As a result of the report by the Assistant Secretary of Defense (Comptroller),⁶ a Directorate for Output Measurement Systems was established within the Office of the Deputy Assistant Secretary of Defense (Management Systems Development), and was staffed with officers from each Military Service to begin work on this program.

Concept

Essentially, the Output Measurement Systems Program seeks to identify and provide capabilities information heretofore not available within the framework of the Planning - Programming - Budgeting - Accounting System (PPBAS). It sets out to describe the end product of all previous phases of the PPBAS.

Figure 1 illustrates how the development of precise measures of output information closes the loop in the PPBAS. Processing of information within each one of the steps shown, and converting it into implementing decisions at the next

⁶ Report by a Preliminary Study Group, "Improved Ways of Measuring Output," May 31, 1967.

step, requires the ability to arrange and account for information in precise detail. Unfortunately, the means used to identify, acquire and process measures of output are not so precisely identified or described as they are in the other phases of the PPBAS, thus true measures of output achieved as a result of resources consumed have frequently not been available.

The purpose of the Output Measurement Systems Program, as approved by the Deputy Secretary of Defense in DOD Directive 7000.4, "Output Measurement System," dated April 13, 1968, is to effect a major improvement in the:

- Capability to describe the output of all DOD organizations.
- Quality, availability and utility of output measures to support and influence decisions, affecting both the employment of forces and the management of resources.

The Defense Department, as the largest department of the Federal Government, is not organized or designed for motives of profit as are organizations in our civilian community. However, the very magnitude of its operations, involving a total estimated budget of over \$80 billion for FY 1969, requires the development and exercise of improved management techniques, in many ways similar to those used in civilian

organizations, to ensure the maximum output for moneys expended. It is within this context that output measures are defined:

Useful descriptions of (a) functions, tasks, or missions performed by an organization expressed in relation to those assigned, and (b) capabilities possessed, compared to those for which the organization is designed.

Every organization—whether a ship, an infantry battalion, or an aircraft squadron—has been configured and allocated resources to enable it to perform currently assigned functions, tasks, or missions. These organizations also consume resources or inputs in maintaining their capability to perform other functions, which they are expected to be able to perform if called upon. For example, during a given 30-day period, a bomber squadron was directed to destroy 100 targets (performance assigned). The squadron actually destroyed 83 of these targets (actual performance). Simultaneously, the squadron was designed, configured and tasked to be capable of delivering nuclear weapons against 12 targets if directed (designed capability). By a detailed examination of the resources actually available to the squadron, its commander estimated that it actually possessed the capability to deliver nuclear attacks

effectively against only eight of these targets (actual capability). Thus, during this 30-day period, the squadron consumed resources to produce an output which included factors of two kinds: actual performance (such as delivery of conventional attacks) and actual capability (such as capability to deliver nuclear attacks).

Output measures presently exist for many organizations in the Defense Department. However, in most cases these measures apply to support type organizations and are described as number of meals served, vehicles repaired, tons of supplies moved, number of students graduated, number of patients treated, etc.

How is output measurement information used by the staff in supporting the decision-making process?

- They examine historical records showing functions actually performed and capabilities actually possessed by similar organizations during representative periods.

- They analyze these records of past output in conjunction with corresponding records of the resources known to have been available to the organization, and the environmental conditions known to have been in effect, in order to improve initial correlations among these factors.

- They calculate what resources should theoretically be required to produce certain results, or output. They may employ models to determine and test how output is most likely to vary in response to assumed changes in input, deriving tentative correlations as a basis for further work.

- They ascertain from the organization manager what levels of output the latter desires the organization to be able to produce in the future.

- They calculate, applying the relationships between outputs and resources which they have already established, what changes in resources or in the management of the organization will be needed, in order to attain the desired levels of output and determine the costs of any needed resources.

The organization manager, with his staff's recommendations, weighs the prospective change in output against the costs of resources or

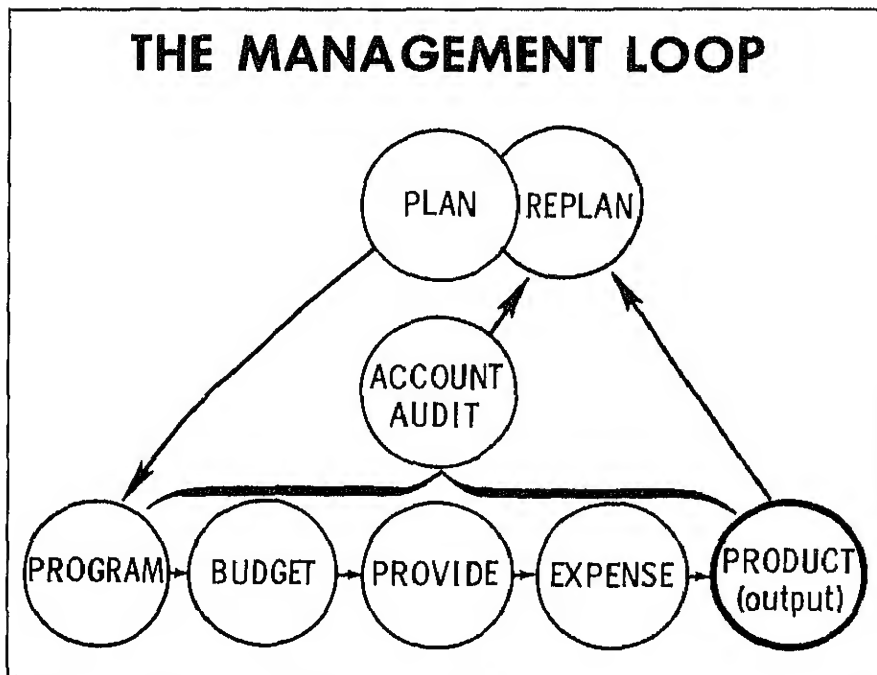


Figure 1.

actions needed, and makes his final decisions.

After implementation of these decisions, the manager and his staff observe and continuously evaluate the actual output of the organization in light of the desired output and the resources consumed.

Development and Implementation

The events that are partially described herein will be expanded and more fully developed with the issuance of the DOD Output Measurement Systems Development Plan. Those events that are cited here are the initial steps in a program that may take several years to fully develop, refine and implement.

Eventually, the Military Departments must initiate actions to develop documented information lists of Designed Organizational Capabilities (DOC) for each type of organization within their force structure. Initially, however, the magnitude of this event will be limited by the issuance of test guidance from OSD. Nevertheless, certain preliminary steps are being undertaken to ensure an orderly approach to the development of the entire program, and to determine if the results of this initial test provides information useful to the Military Departments, the Joint Staff, and offices or agencies within OSD.

Nature of Capabilities Information.

Capabilities information consists of official assessments of the capabilities of DOD organizations. Each assessment of capability results from an analysis of organizational performance data, environmental conditions, resources observed to be available, correlations previously established among these factors, and contributory assessments of capabilities. The capabilities to be appraised include all those which the organization would be expected to possess if it were in all respects equipped, manned and trained to fully accomplish its assigned mission.

Distinction Between Resource Information and Capabilities Information.

Current data reflecting the resources actually available in an organization is valuable for making

decisions, since it is often obvious that a specified resource deficiency will inevitably result in loss of certain designed organizational capabilities. Lack of ammunition obviously results in reduction of effective firepower. However, the same designed organizational capability may be affected by other less obvious conditions. Even with ammunition replenished, firepower may still be degraded by lack of training or repair parts. On the other hand, a single resource deficiency may result in the loss of several designed organizational capabilities. A critical shortage in electronics repair personnel may result in loss of firepower, communication with maneuvering elements, and even a degrading of the effective command and control of the organization.

The establishment of dependable correlations between resource deficiencies and degradations of designed organizational capabilities requires the determination of all capabilities which the organization has been designed and equipped to accomplish, plus an extensive analysis of recorded observations of the relations established.



Lieutenant Colonel George B. Coe, USA, was assigned to the Directorate for Output Measurement Systems, Office Asst. Secretary of Defense (Comptroller), when this article was written. He has served on the military staff, Office of the President, and the Army General Staff. He is presently on duty with the Headquarters, Desert Test Center, Fort Douglas, Utah. In 1967 he earned a masters degree in government from George Washington University.

OSD and Defense Agency Requirements for Output Measurement Information.

Implementation of the DOD Output Measurement System Program will, in itself, neither entail nor preclude establishment of new requirements for recurring reports. It is the normal prerogative of every commander to call for such reports from elements of his command as he considers necessary and feasible. Improved output measurement systems should serve to reduce redundancy and duplication in existing reports, improve their quality and usefulness, reduce the administrative effort required for their preparation, and forestall new requirements for information already being reported.

Apparent Deficiencies in Performance Information.

In general, considerable effort has been and is being expended to organize and improve resource information in the Defense Department and elsewhere. This is not true regarding output information. Performance and capabilities information appears to exist in considerable volume, but remains difficult to manage for the following reasons:

- It is frequently difficult for the analyst or staff officer to determine what performance information presently exists which will serve his immediate purpose.

- Once located, performance information is difficult to transfer from source to user. Security classifications become a major problem in transferring automated data.

- Performance data are largely recorded in non-standard format and are, therefore, difficult to correlate with resource data, environmental information, performance standards, capabilities information, or other performance data, and difficult to employ in automated models.

Apparent Deficiencies in Capabilities Information.

Recorded assessments of actual capabilities are subject to all of the deficiencies mentioned previously in relation to performance information. Additional deficiencies are:

- Without standardization of units of measure and data elements, capabilities assessments generally cannot be correlated with performance data.

so that the total picture of an organization's output is, under these conditions, difficult to form over any selected period of time.

- Means do not exist whereby all significant changes in the capabilities of every organization can be assessed and recorded, particularly in circumstances where changes occur rapidly.

- Functions, tasks, or missions which certain organizations are expected to be able to perform, when fully equipped, manned and trained, have not been documented. For such organizations, it is not possible to compare actual output with designed or planned output.

- To assist the analyst in determining the reliability of assessments of capability, particularly those made by commanders in the field, information is generally unavailable as to the standards or methods of evaluation upon which such assessments are based. This reduces their values so markedly that the analyst is prompted to discard such information as being the product of "subjective judgment," without much value for analytical purposes. On the other hand, information regarding possession of many capabilities remains unobtainable from any source other than local evaluations.

- Up-to-date capabilities information is not available to OSD, either to keep track of important changes in current capabilities, or to discern trends or comparisons meriting further study.

Corrective Measures Initially Planned.

The Output Measurement Systems Program proceeds from the assumption that the need for the following types of corrective measures is sufficiently evident to warrant implementing action:

- Documentation, within the Services, of those functions which each organization is expected to be able to perform, when fully equipped, manned and trained.

- Determination, by OSD and the Services, of those elements of terminology, units of measure, coding structures, data element formats, and related methods of expressions, for which uniformity and compatibility on a department-wide basis would be useful. (This will require review of

all output measures in use and needed throughout DOD.)

- Determination, by the Services, of requirements for improved automatic equipment for recording performance data and environmental conditions, for up-to-the-moment assessments of capability, and for transferring, storing and sorting available output measurement information by rapid means under secure conditions.

- Establishment, by the Services with OSD coordination, of automated cataloging facilities in order to keep track of what performance and capabilities information is currently available; and to show what types of data collection equipment and instrumentation are in use or under development.

- Adoption throughout DOD, with OSD coordination, of the best possible techniques for recording and rapid handling of information available in narrative form.

- Modification of the Joint Operation Reporting System to reflect the current capabilities of major units of the operating forces on an up-to-date basis, and establishment of a similar structure by which the current capabilities of logistic and support organizations can be quickly reported, when required.

- Institution by the Services, with OSD coordination, of research and development programs addressing advanced techniques for originating, transferring, and using output measurement information for both management and operational purposes.

- Establishment of effective feedback procedures so that all activities recording and reporting output information are apprised of the results of their efforts.

The establishment of a Planning-Programming - Budgeting - Accounting System by OSD has resulted in major improvements in the management of resources allocated to the defense establishment. Exhaustive efforts over the past several years by the Military Departments, the Joint Chiefs of Staff, and the offices and agencies within OSD are responsible for the successful implementation of this system.

Although defining and establishing precise output information for mili-

tary organizations is a complex task, it is necessary that the Military Departments develop adequate procedures for describing the output of each type organization. The development of this information, heretofore not available, must be viewed as the real "pay-off" of efforts to develop improved resource management systems, and will be responsive to the requests of the President and the Secretary of Defense.

The establishment of an Output Measurement Systems Program is evolutionary and consistent with the financial management improvement programs that have originated within the defense establishment. The program builds on the previously well established procedures designed for closing the "management loop."

AFA Sets Fall Meeting

The fourth annual Fall Meeting of the Air Force Association will include three days of aerospace management seminars and the largest industrial display in the history of the meeting. All will be held in the Sheraton-Park Hotel, Washington, D.C., Monday through Wednesday, Sept. 16-18.

Monday's topic will be "Aerospace Test Facilities: A Shrinking National Resource." Tuesday's subject, "The International Aerospace Market," will cover the incentives and barriers now shaping America's future position in the world marketplace. Wednesday's seminar will cover "Commercial Supersonic Flight."

Forty-one aerospace defense firms will show equipment and present 45 daily briefings. Attendance is expected by employees of the Defense Department and other government agencies. Morning visitors may select and attend nine of the briefings in escorted groups of 15 to 20 persons. Afternoon visitors may attend any of the briefings.

Although there is no admission fee for the displays, luncheons, or receptions, advanced registration is required to fill quotas. Registration forms are available in government offices.

The Fall Meeting will also feature an Air Force-Industry luncheon, and the annual black-tie anniversary dinner-dance saluting the U.S. Air Force.



FROM THE SPEAKERS ROSTRUM

Exploiting Marine Mineral Resources— Problems of National Security and Jurisdiction

Address by Hon. Robert A. Frosch, Asst. Secretary of the Navy (Research & Development), at the Naval War College Conference on Mineral Resources of the World Oceans, July 12, 1968.

The various leaflets and letters announcing this symposium have listed "Matters of Military Concern" as the topic of my address. Considering the far-reaching complexities involved with the oceans' resources today and, at the same time, the vastness of the military's oceanic interests and responsibilities, I think it is important that we word the topic with greater precision to read "Matters of Military Concern Connected with Marine Mineral Resources."

The scope and nature of civil activities in the oceans and on the seabeds is increasing rapidly, and current technological developments indicate that exploitative activities on and beyond the continental shelves will continue to grow in both magnitude and variety. Such growth will logically result in various types of physical plants for extractive or processing purposes, transportation and life support systems, power generation plants, and other appurtenances of marine mineral industrial activity.

At the same time, international political interest in the oceans and seabeds has been aroused in recent years by the 1958 and 1960 United Nations Conferences on the Law of the Sea, by the growing international exploitation of fisheries, by the seaward steps of the petroleum industry, and by growing interest in the exploitation of marine mineral resources. This is also demonstrated, in part, by the current activities of the United Nations Ad Hoc Committee on the Seabeds, and by suggestions from various quarters, both

at home and abroad, to the effect that man is churning the oceans into legal chaos, and consequently sweeping new international legal action is required to define a law of the seabed. We can expect this interest to increase rather than diminish in the future.

Both the technological and the political developments relating to marine mineral resources are of professional concern to the military: first, because they will give rise to a new order of military requirements along with new problems of accommodation between military and other uses; and second, because they have the potential for changing the traditional nature of the freedom of the seas and, in so doing, would have major implications for military aspects of the nation's security.

Accordingly, I would like to address three topics:

- Requirements for military capability arising in connection with the exploitation of the mineral resources of the oceans.

- Problems of accommodation between military and non-military uses arising from the exploitation.

- Problems in legal regimes (including arms control regimes) triggered, at least in part, by the problems and prospects of exploitation.

In discussing these subjects I will consider them from the point of view of one responsible for military uses of the oceans and of military security, giving at best only passing notice to other aspects of overall national security, of which military security is only one ingredient. Many other aspects of these problems are being covered elsewhere in this symposium.

This is an exceedingly complex subject, and many diverse views are being considered. The statements made herein should be considered as my thoughts on the subject

and should not necessarily be interpreted as representing official governmental positions.

As a foundation for my discussion, I will describe some of the principal aspects of the involvement of the military with the sea.

Many military uses of the ocean stem from general uses of the ocean. Where man goes his problems go, where man's problems go his conflicts go, and where man's conflicts go his military forces follow. I note parenthetically that it sometimes seems to be implicitly assumed that removal of the military forces somehow removes the conflicts and the problems, but I see no reason to believe this, except in the occasional case where the presence of the military force makes the problem or the conflict. In any case we may call this the first class of military uses of the oceans, general use of the oceans.

A second class of military uses of the ocean stem from special properties of the ocean, including the fact that there is no sovereignty there, the fact that the sea provides special kinds of concealment, and the fact that it is an arena generally empty of human population concentrations.

A third class of military uses stems from uses generated in response to the military uses called out by the first two classes, and by those in the third class. (I fold the third class into itself to avoid a useless sequence.)

Within these categories lie a wide range of present and possible future military activities, most of which can be influenced by changes in national or international views of jurisdiction, or by access to and jurisdiction, or by access to and use of the ocean floors and seabeds; changes that could result from international political action related

primarily to the world's marine mineral resources.

Included in the phrase "general use of the oceans" are the traditional, time-honored uses of the world's oceans to move military forces to or against foreign shores and to prevent such movements against our own shores. General use includes the protection of U.S. shipping, fishing, and other property at sea; it includes the entire spectrum of naval activity—surface, subsurface, and in the air above the seas. Such use is the essence of naval power. If we are not careful in how we tamper with the factors that permit it, we may harm our national interest.

In the second category, "military uses generated by special properties of the oceans," we include those uses which take advantage of the mobility and concealment made possible by the marine environment. The flexible and highly invulnerable Polaris deterrence system is a prime example of such use, as the follow-on Poseidon system will be.

The third category, "military uses generated by other military and by civil uses," includes such activities as anti-submarine warfare; air defense of fleets, forces, and merchant shipping; submarine warfare; mine warfare; search, rescue, and salvage missions; and oceanographic forecasting. Within this category, there are several possible military uses of the continental shelves and seabeds. Saturation diving techniques, for example, together with future submersibles, sensors and tools may permit greater military use of the ocean floor. Such use could well be threatened or limited by changes in the legal regime for the deep oceans.

As the nation's civil activities in the oceans and on the seabeds increase, the Navy can expect a considerable increase in tasks and requirements. At present, for example, a world-wide civil and military salvage network is in operation under Navy management and control.

By law (Public Law 513 of the 80th Congress and 10 U.S. Code 7361, *et. seq.*) and policy (OPNAV Instruction 4740.2B), while the Navy does not commit itself to maintain salvage facilities in excess of Navy requirements, the Secretary of the Navy can and does provide necessary salvage facilities for public and private vessels upon suitable

terms. In effect, the Navy is the principal salvage agency of the Federal Government, working with Navy vessels and contract services to fill gaps in normal commercial salvage capabilities where necessary. This work is carried out, world-wide, by the Supervisor of Salvage working under the Naval Ship Systems Command. In addition, the Navy assists the Coast Guard in carrying out its statutory responsibility for the safety of life and property at sea by providing additional men and ships when required. In fact, the Navy participates in the traditional law of the sea: give help where help is needed.

Requirements Arising from Exploitation

The growing numbers of ships, submersibles and divers, operating from the near-shore to the deep-ocean environment, will inevitably require more rescue and salvage operations. For example, as more and more divers experiment in the months and years to come with saturated diving, there may be an increased need for man-rated hyperbaric facilities just to handle emergencies resulting from such diving. Also, we can expect that increasing requirements for rescue of personnel and salvage of material will be the inevitable result of growth in the fishing and maritime industries. The possible necessity of expanding the Navy's salvage network, and increasing its capabilities to deal with such growing requirements is certainly worthy of the most serious consideration.

In this connection, there is a growing requirement for safety certification of commercial and recreational submersibles. The Coast Guard has the responsibility for general certification and for the definition of standards of safety, etc., but, because the Navy has the greatest capability in the Federal Government in the technology of submersibles, we are working with the Coast Guard, both in the initial stages of standards preparation and to assist them in acquiring the necessary skills and capabilities to carry on the work themselves in the long term. I think it worth mentioning at this point that there is a long tradition of cooperation between Navy and

Coast Guard in carrying out our respective peacetime missions, in addition, of course, to our close association in war time.

Navy certification of commercial or private submersibles is only in connection with their use by the Navy or its personnel.

As mineral exploration and exploitation activities, be they for sulphur, petroleum products, or heavy metals, increase and extend seaward, associated problems will increase not only for rescue and salvage work, but also for protection and policing of U.S. nationals carrying out commercial activities on the surface, in the water column, and on the seabed.

While the United States, of course, looks first to diplomatic or peaceful legal resolution of any problem of the protection of its citizens, when engaged in lawful activity on the high seas, against arbitrary interference by other powers, or by piracy, this has to be backed up by a military potential. This requirement may be expected to extend to similar lawful activity in the water column or on the seabed. Such protection would, again, presumably be a responsibility shared between Navy and Coast Guard, depending somewhat on the nature and location of the problem. Clearly we will need the military capability to operate everywhere the technology can go to exploit, if we are to fulfill this requirement.

These new and increasing challenges, relating to marine mineral resources activities, are functions for which the Navy and Coast Guard will accept responsibility as part of their overall missions. We should remember, however, that they are requirements that may demand an expanded effort on the part of the Navy and Coast Guard in terms of manpower, operating forces, shore facilities, and funding.

Another factor of interest to the military, stemming from marine technological development, will be the effect, in terms of interference or hazards, that the growing number of offshore and deep-ocean platforms, structures, ships and related activities have on military operations in the marine environment. The Navy, for example, will have to be more and more on guard against physical interference from moving objects; in turn, it will have to be continuously aware of locations at

which there are on-going marine resource exploitation activities. A partial list of expanding activities posing interference problems would include fishing, petroleum exploration, drilling, petroleum production operations, salvage work, recreational boating, merchant traffic, and oceanographic surveys being conducted by means of ships, buoys, free submersibles, towed submersibles, tethered submersibles, seabed vehicles, and seabed installations.

A recent review of the situation indicates that naval operations involving individual ship exercises have been most affected by (and presumably have most affected) non-military oceanic activities which have included fishing, merchant traffic, recreational boating, and ocean survey operations. To a lesser degree, amphibious, gunnery, and replenishment operations, anti-submarine warfare exercises, and air-sea rescue operations have been affected by the same kinds of interference. Minesweeping and mine-hunting experimental work and exercises have experienced interference from recreational boating, fishing activities, oil drilling operations, and the establishment of artificial reefs.

While non-military interferences have increased in recent years, they have not, by and large, created serious problems for the Navy, and we hope that naval operations have not created serious problems for others. In the great majority of reported interference incidents, the Navy ships involved have either accommodated or adjusted to the non-military activity. The Navy has, for example, modified operations sufficiently to permit their completion with minimum interruption; in many cases it has solved the interference problem by giving more sea room to the non-military activity. It has largely accommodated the oil industry in this fashion by moving seaward, away from drilling and production operations.

The Navy is a firm believer in the concept of accommodation of many different users, a concept which is, of course, fundamental to the present law of the sea. For example, the Convention on the Continental Shelf authorizes coastal nations to erect installations on their shelves to explore and exploit seabed and subsoil resources but, at the same

time, stipulates that this exercise of authority must not result in any unjustifiable interference with navigation, fishing, or conservation of living resources. The Gulf of Mexico offers an excellent example of the successful application of this concept in an area of high-intensity marine activity.

In summary, while this "crowding" of the oceans is of concern to the military, it does not post an insurmountable problem. As we have for many decades, suitable arrangements will be made for multiple users using the historic principle of the international law of the sea as codified in Article 2 of the 1958 Geneva Convention on Law of the Sea.

One further point to keep in mind, however, is that it is not necessarily easy to move a military use of an area. The costs may be high, perhaps so high as to be prohibitive, particularly when extensive on- and offshore facilities such as ranges are involved. This suggests the need for careful long-range planning by all potential users of an ocean area so that future conflict may be minimized.

Problems Arising from Possible Legal Regimes

Present-day naval operations are conducted in an international legal regime in which the principle of freedom of the high seas prevails: All nations have an equal right to use the high seas, one nation may not unreasonably interfere with the lawful use of the high seas by another, and each nation has jurisdiction over activities conducted on the high seas under its flag or nationality.

Under the present regime, national jurisdiction over exploration and exploitation of the seabed is limited to a relatively narrow offshore area adjacent to the coastal nation and short of the deep-ocean seabed. In general terms, the law of capture applies to marine mineral resources, with title to the resources vesting only once they have been dredged, mined, or otherwise removed. The explorer and exploiter are both protected and limited by the requirement that each user have reasonable regard for the activities of other

users. The user's nation can control his marine operations.

Changes to the international law of the sea will undoubtedly be required, as changes have been required and made in the past. In all likelihood, it will be essential, for example, for nations to agree on a precise outer limit for the extension of national jurisdiction under the regime of the continental shelf. Nations may also ultimately need to resolve conflict-of-use problems on the seabed and subsoil of the deep oceans. As indicated by my earlier comments, the problem of such conflicting use on the high seas is not a new problem. In the past, as specific problems have arisen, specific solutions under international law have been devised to provide for an accommodation of interests. Lying behind these specific rules is the general rule of international law that one use of the high seas may not unreasonably interfere with other lawful uses.

Any number of suggested new regimes for the world's seabeds, their exploitation, and their ownership are being advanced, most involving either greater restrictions or greater international involvement than does the present regime.

Under the terms of a Flag State Regime, for example, a nation would have exclusive jurisdiction over a vessel flying its flag, and it would have responsibility with regard to what those individuals operating under its flag could lawfully do in light of the rights of other nations. The nation of the marine minerals explorer or exploiter would have a protective interest in the resources to be exploited within a reasonable area, although national sovereignty over areas of the deep-ocean seabed would be prohibited.

The Median Line Regime would have the coastal nations divide the entire oceans, seabeds and subsoil among them on the basis of median lines equidistant from the nearest land. In its ocean area, the shore state would control right of access, prescription and appropriation.

Alternatively, the International Registry proposal would have the establishment of an International Registry Agency which would, for a fee, register flag state claims. The agency would presumably exercise some authority regarding competing claims, thus validating certain flag state claims.

Going one step further, the proposed regime of a Limited International Authority would establish an international agency with limited rights to lease the seabed and prescribe regulations, but no general ownership rights.

Finally, a regime of Complete Internationalization would include the establishment of an international agency which would own the seabed, the subsoil, and their resources with authority analogous to sovereignty over marine mineral resources.

I would like now to point out another interim approach toward clarification of principles related to different seabed users. I refer to the Seabed Principles introduced by the United States at last month's meeting of the United Nations Ad Hoc Committee. From the military viewpoint, these principles, intended to guide nations and their nationals in the exploration and use of the deep-ocean floor and its subsoil, offer a most useful approach to seabed problems.

They do not imply a "freeze" on marine mineral resources exploration and exploitation activities while specific seabed rules evolve from the practice of seabed users or are negotiated in the abstract.

Another aspect of the interaction of resource exploitation and military uses involves the problem of arms control. Mineral resources and arms control do not necessarily travel hand in hand; the two are often linked, however, in proposed new regimes for the marine environment. As any arms control agreements relating to the continental shelves and deep ocean floors are matters of critical concern to those responsible for the nation's security, a brief comment on seabed arms control proposals being advanced, either as part of the proposed seabed regimes or otherwise, is in order.

At present, subject to the provisions of the United Nations Charter, there are few restrictions on defensive military deployment and activities in the oceans. Coastal state consent is required for territorial sea and, to some extent, continental shelf operations. Additionally, there are the normal constraints of the rules of war (including the Geneva Conventions); the restraint against unreasonable interference with other users; and the limited test ban treaty which prohibits underwater, at-

mospheric, and space nuclear tests. The various arms control proposals which have been discussed might, among other things, prohibit the stationing or affixing of nuclear weapons on the seabed, restrict the seabeds of the world for peaceful uses only, or demilitarize them completely.

With regard to these proposals, the point I wish to make is that several nations already have a capability to use the oceans and seabeds for military purposes. This situation dictates that any international effort to limit military uses of the continental shelves and deep-ocean floors must be subject to truly effective controls and measures for verification: the ascertainment of treaty violations on the part of other nations.

Military View on Proposed Seabed Regimes

In all of the marine mineral activity, both political and technological, underway today considerable attention is being focused on the need to be able to distinguish more clearly between the continental shelf and the deep-ocean bed. It is significant to note that this distinction is not of great importance to the military as it views the proposed regimes for seabed mineral exploitation and arms control. The military seldom has need to make such a distinction in its oceanic operations, being concerned instead with the extent of national jurisdiction that is the breadth of the territorial sea. The Navy is con-

cerned, however, that proposed seabed regimes might eventually result in claims and restrictions on the use of the superadjacent waters and, secondly, might lead to information and reporting requirements that would pose unnecessary problems for military operations. While the Navy is free to operate on the high seas, and while it generally has the right of innocent passage through foreign territorial waters, it must gain the consent of the coastal state if it wishes to operate in foreign territorial waters.

The military view has been, and continues to be, that any extension of territorial seas should be kept to a minimum, sovereignty over the continental shelves (whatever their seaward boundary) should be closely limited, and the air space above the high seas should remain free.

The security of the United States rests in part on the Navy's use of the high seas, and we would like to see the use and legal coverage of the high seas develop in such a way as not to impede this portion of our security unnecessarily. The military has neither the desire nor the intention to impede the full development of marine mineral resources. Rather we see fuller exploitation as a natural and positive development, but one which will require new capabilities for policing and protection and, thus, poses new military problems. We hope that the development of the requisite law will proceed together with the development of exploitation and its technology, so that the law will not impede the development nor channel it in directions that later turn out to be unwise or difficult to protect or police.

I might add that the Navy has another interest regarding marine mineral exploration and exploitation activities. That is, within the limits of national security, to make available from its ocean engineering program all the technological and scientific information possible for use by marine mineral explorers and exploiters—information ranging from bathymetric data to the technical information required for submarines and submersibles. The Navy is most anxious to cooperate with the whole public and private community in developing a national program for the oceans with the objective of enhancing national security in its largest sense.



Hon. Robert A. Frosch



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Ernest Louis Massad has been sworn in as Dep. Asst. Secretary of Defense (Manpower and Reserve Affairs), a new position established by the Reserve Forces Bill of Rights and Vitalization Act of 1967.

David Charles Stewart has been sworn in as Dep. Asst. Secretary of Defense (Manpower and Reserve Affairs) for Special Manpower Programs.

Maj. Gen. Robert H. Warren, USAF, has been nominated by President Johnson for promotion to lieutenant general and assignment as Dir. of Military Assistance, Office of Asst. Secretary of Defense (International Security Affairs).

Brig. Gen. Charles H. Phipps, USA, has been named Commander, Defense Contract Administration Services Region, New York.

Capt. Tazewell T. Shepard Jr., (rear admiral selectee), has been assigned as Dir., East Asia and Pacific Region, Office of Asst. Secretary of Defense (International Security Affairs).

Defense Industry Bulletin Gets New Editor

Lt. Cdr. E. Wayne Bradford, USNR, editor of the *Defense Industry Bulletin* since the first issue in January 1965, has retired from the Navy, effective Sept. 1, 1968. He has been succeeded as editor by Lt. Col. Matthew W. Irvin, USA.

Lt. Cdr. Bradford was responsible for all aspects of the *Bulletin* since its beginning. In its three-year history, the magazine has grown from a circulation of 1,100 defense contractor subscribers to more than 20,000.

Col. Irvin comes to the Office of Assistant Secretary of Defense (Public Affairs) from Vietnam, where he was a public affairs officer on the Military Advisory Command Vietnam (MACV) staff. Prior to his Vietnam assignment, he was associate editor of the *Army Digest*.

DEPARTMENT OF THE ARMY

Lt. Gen. Charles W. G. Rich has been designated Dep. Commanding General, U.S. Continental Army Command. Lt. Gen. Frederick C. Weyland relieves Gen. Rich as Chief of Reserve Components, Department of the Army.

Maj. Gen. Frank M. Izenour has assumed command of the U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md. He succeeds Maj. Gen. Leland G. Cagwin.

Brig. Gen. George Heacock McBride is the new Dep. Commander at the Army Aviation Materiel Command, St. Louis, Mo.

Col. Quellen D. Boller has assumed duties as Dir., General Equipment Testing Directorate, Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

Col. Jack G. Hines has taken command of the Army Strategic Communications Command - CONUS, Suitland, Md.

The Army Missile Command, Redstone Arsenal, Huntsville, Ala., has two new Project Managers. They are: Lt. Col. Robert W. Huntzinger, TOW anti-tank weapon system, and Lt. Col. Robert J. Proudfoot, Shillelagh missile system.

DEPARTMENT OF THE NAVY

RAdm. Frank L. Johnson has taken the helm as Commandant, Thirteenth Naval District, headquartered at Seattle, Wash. He comes to the new post from duty as Commander, U.S. Naval Forces, Japan.

RAdm. Sam H. Moore has been assigned duty as Commander, Military Sea Transportation Service, Far East, with headquarters in Yokohama, Japan.

RAdm. Lawrence R. Geis has been named Chief of Information, U. S. Navy. He succeeds RAdm. Henry L. Miller who has been assigned as Commander, Naval Air Test Center, Patuxent River, Md.

RAdm. Harry C. Mason is the new Dep. Commander, Engineering Directorate, Naval Ship Systems Command. Capt. Burton H. Andrews, (rear admiral selectee), relieves Adm. Mason as Vice Commander, Naval Electronic Systems Command.

Capt. John D. Chase has been named Commander, Naval Weapons Laboratory, Dahlgren, Va.

Capt. Wallace R. Dowd Jr., (rear admiral selectee), has been assigned as Commanding Officer, Naval Supply Center, Charleston, S.C.

Capt. William P. Holden is the Navy's new Project Manager for the Naval Inshore Warfare Project, Naval Material Command.

DEPARTMENT OF THE AIR FORCE

The Senate has confirmed the reappointment of Gen. John P. McConnell as Chief of Staff, USAF, for a period of one year beginning Aug. 1, 1968.

The following assignments have been made in the Air Force Systems Command: Brig. Gen. Guy M. Townsend, Dep. for Systems Management, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; Col. Benjamin N. Bellis, Dep. for Reconnaissance, Aeronautical Systems Div.; Col. Robert M. Horning, Dir. of Materiel, Air Force Flight Test Center, Edwards AFB, Calif.; Col. Floyd H. Trogdon, Vice Commander, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. Robert E. Walters, Chief Electronics Test Div., Air Proving Ground Center, Eglin AFB, Fla.; Col. Hugh Wynne, Dir., Atlas/Minuteman Program Office, Space and Missile Systems Organization, Los Angeles, Calif.; and Col. Joseph F. Marling, Chief, Combat Systems Program Office, Aeronautical Systems Div.

New assignments at Air Force Logistics Command headquarters, Wright-Patterson AFB, Ohio, include: Col. Billie J. McGarvey, Dep. Civil Engineer; Col. Albert M. Nemetz, Dir., Resource Planning; and Col. Robert E. Hails, Asst. Dep. Chief of Staff, (Maintenance Engineering).

The Role of Training Devices in Developing Military Skills

Captain Jack N. Miller, USN

The creation of the Naval Training Device Center 26 years ago marked the beginning of a new era in the training of military personnel for combat. Before that time, a naval aviator in training first came in contact with the controls of a naval aircraft when he strapped himself in the cockpit. Naval officers and men learned to operate a submarine by going out to sea and making dives. Navy gunners learned how to hit enemy targets by firing live ammunition. Training was slow, it used equipment that might be needed for operations, and the element of danger was always present.

Today every fighting man of any of the three Services has most likely undergone realistic combat training through the use of simulators or synthetic techniques pioneered by the center. Now, when a man steps into an aircraft cockpit for the first time or makes his first dive in a submarine, he is in familiar surroundings and operates controls he has already handled. The time and cost of training have been sharply reduced. Even more important, a man learning through the medium of a simulator does so without danger to himself or his fellow crew members, and without the possibility of accident with or damage to expensive equipment.

The use of training devices to prepare the fighting man in his many skills is not new. Training devices or simulators have been used for centuries. In the age of battlements, soldiers were trained on mockups prior to the attack on an actual

fortress. In the time of knights, jousting skills were taught with a "teaching machine" called a quintain. If the trainee struck this trainer squarely in the middle of the shield, it would fall over. If the knight in training struck the quintain incorrectly, it would swing around and hit him.

For over a quarter of a century the Naval Training Device Center, with headquarters now at Orlando, Fla., has played a major role in



Captain Jack N. Miller, USN, is Commander, Naval Training Device Center, Orlando, Fla. A naval aviator for 25 years, his previous assignment was Dir., Astronautics Div., Naval Air Systems Command. He holds a B.S. degree in chemical engineering from the University of Missouri, and M. S. degrees in aeronautics from the California Institute of Technology and aeronautical engineering from the University of Michigan.

the research, development, production, and maintenance of training devices and equipment for all branches of the Service. In addition to our own Army, Navy, Air Force, and Marine Corps programs, the center has been active in the Military Assistance Program, providing simulation equipment to friendly foreign nations. To a lesser extent, the center also provides training devices to civilian agencies of our Government.

Just what is a training simulator (training device)? A simulator is a device which enables the trainee to operate or perform under conditions likely to occur in actual environment. A simulator may range in complexity from a simple, hand-held device costing a few cents to a multi-million dollar training complex utilizing digital computers and housed in an entire building.

Devices Simulate the Real Situation

Training simulators of today are meeting the challenge of advanced technology reflected in sophisticated weapon systems. The flight and tactics trainer duplicates the pilot's cockpit and weapon systems stations of the operational aircraft. The pilot and his crew see the same instruments found in the operational aircraft being simulated, and must respond to these simulated instrument readings on a real-time basis. Realism extends to the sound of tires as he makes his simulated landing. The land-locked submarine trainer realistically simulates diving

techniques, complete with motion, and all of the complex tasks associated with the countdown of a Polaris missile.

It often requires a series of trainers to simulate fully an operational system. For example, the A-7A Corsair II is a single-place, light-attack, jet aircraft now in operation with the Fleet. Simulators which support pilot training are the Radar System Trainer (Device 15A18), the A-7A Cockpit Procedures Trainer (Device 2C15), and the A-7A Weapon System Trainer (Device 2F84), the principal device for pilot training. This trainer gives the pilot, in a simulated environment, all the procedures and techniques required to accomplish his assigned mission.

The device contains both flight and tactics (radar and electronic countermeasures) sections, which may be operated independently or in conjunction with each other so as to provide training in the complete weapon system. Instructions for the pilot in all phases, ranging from familiarization to full mission, can be provided by the simulator.

An instructor station is provided to control the conditions of training, introduce emergencies, and act as ground station for instrument navigation problems. A digital computer is utilized in the flight section, which will provide revision of the A-7A flight parameters as they are developed and/or modified.

The device is provided with a full-scale replica of the cockpit section of the aircraft with all control and instrument characteristics fully simulated. By the use of variable intensity lighting, varying conditions of daylight and clouds are simulated. Sounds associated with jet engine start, taxi, takeoff and flight are simulated by a system of audio oscillators and noise generators to provide aural sensations of flight.

The training simulation concept in support of the A-7A can apply not only to other aircraft, such as the A-6A, but also to other operational systems on the land, on the sea, and under the sea.

Due to technological advances, fleet anti-submarine warfare (ASW) weapon systems have become extremely sophisticated and complex. In order to use this equipment effectively and efficiently, fleet personnel must be thoroughly trained and skill-

ed as a team in surface ship ASW attack tactics. In recognition of this problem, the Navy, through the Naval Training Device Center, instituted a program to develop an electronic, digital computer-controlled Surface Ship ASW Attack Trainer (Device 14A2).

The device duplicates the physical configuration of major operational compartments and equipments of surface ship ASW attack weapons, and simulates their functional operation and responses such as target detection, fire control solution, and weapon launching and tracking.

Trainer Helps Plan Tactics

Device 14A2 provides for instruction in equipment operating procedures, develops personnel proficiency, and indoctrinates personnel in ASW procedures and in the evaluation of tactical situations. The trainer is also used in developing and planning advanced naval defense tactics. Typical training problems include target acquisition, tracking, weapon firing, and hit evaluation.

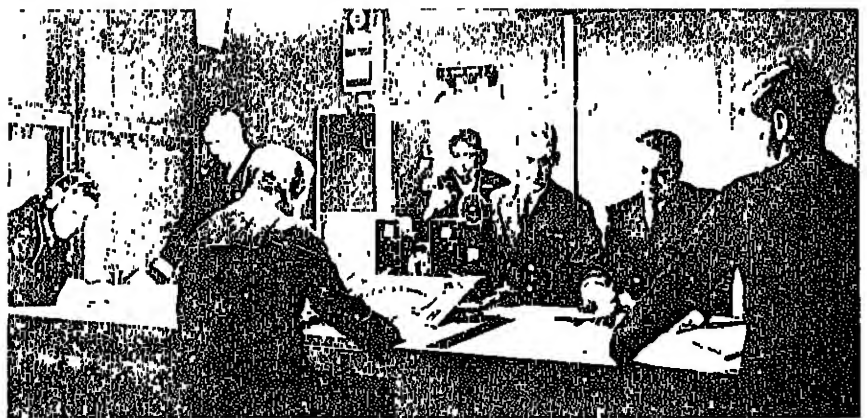
In this same category, the ASW Coordinated Tactics Trainer (Device 14A6) permits the Navy to give realistic, coordinated tactics training to ASW task force crews without the expense involved in actually taking a fleet of ships and aircraft to sea. It can train up to 250 decision-making personnel of an entire ASW task group in the missions they must perform when they are engaged in coordinated intertype tactics. The trainer provides shore-based training with a degree of realism that approaches sea maneuvers.

Device 14A6 consists of several hundred major electronic units housed in a 40,000-square foot building. There are 36 individual rooms that simulate command centers for the various mobile ASW units. Eighteen of these centers are configured to simulate destroyers or submarines. One center simulates an ASW carrier and one simulates a flag plot. Sixteen command centers are available for use as land-based patrol craft, carrier-based ASW aircraft, or ASW helicopters.

The trainees operate these simulated vehicles in an ocean of 360,000 square miles against four instructor-controlled target submarines or up to six manned submarine units, designated as target submarines. All command centers have helm units, plotting facilities, internal and external communication equipment, appropriate sensor capability, and display equipment.

Still another multi-million dollar device, the Combat Information Center Tactics Trainer (Device 15F6), is used in training crews in tactical situations encountered by various ships such as ASW destroyers, cruisers, and guided missile destroyers. It can present to the trainees a total of 128 imaginary targets over a gameboard area of 127,000 square miles.

The role of training in the Navy is steadily expanding. The equipment used for future training is often as technologically sophisticated as the operational equipment itself. The trend is toward large training complexes, such as the fleet Anti-Submarine Warfare School in San Diego. In the next decade, a single master



Students in a Combat Information Center Tactics Trainer conduct simulated anti-submarine warfare over a 127,000 square mile gameboard area.

computer at a central location may be used to provide simulation at many different locations simultaneously.

Meeting Needs for New Devices

How does the Naval Training Device Center meet the requirements of the Fleet and user commands? A rather complicated technical development cycle, using many planning and programming phrases with their associated acronyms, is involved. Reduced to its simplest terms, the Chief of Naval Operations expresses a fleet training requirement, and the requirement is translated into a project by the cognizant Bureau or Systems Command. The Naval Training Device Center then reacts by developing a concept based on the latest training device technology resulting from government and industry laboratory research. This concept is further developed by the center's technical staff and results in a performance specification which describes the proposed trainer. Based on this specification, contracts are awarded for the development and production of training devices. After contract award, engineering personnel review design and conduct subsystem and system tests. Support specialists insure that logistic support material and services accompany the device when it is introduced to the Fleet.

Recognizing industry's major role in the development of training devices, an annual Naval Training Device Center-Industry Conference was initiated in November 1966. The purpose of these conferences is to permit the center's representatives to meet with their counterparts in the simulation industry to openly and frankly discuss mutual problems relating to the procurement of training devices, and to exchange ideas for improving the state of the art. At the first two conferences, individuals gave presentations reflecting their opinion, not necessarily those of the agency or company, and the center has responded to suggestions from industry. One example was the decision to furnish industry with long-range procurement estimates. This suggestion became a fact in May 1967 when the center published, in *Commerce Business Daily*, its Long-Range Procurement Estimating for Fiscal Year 1968, covering the air warfare and sea warfare programs. This step forward allowed

the simulation industry to plan in advance for its possible participation in procurements. While not an Invitation for Bid, this information provided industry with a look at the entire spectrum of planned training devices for all warfare areas of air and sea.

The Technical Director of the Naval Training Device Center selects topics and themes for the annual industry conferences that are of mutual interest to both the center and the simulation industry. For example, the first two conferences included such topics as:

- Predicting Cost and Lead Time.
- 3-M Maintenance Data System and Augmented Support.
- Trends in Digital Simulation.
- Reliability of One-of-a-Kind Training Systems.
- Learning, Retention, and Transfer.
- Optical Systems Limitations for Visual Displays.

Army Unsolicited Proposals

(Continued from page 9)

Each of these commands has numerous subcommands, laboratories, installations and activities under its jurisdiction.

There are also separate activities and laboratories, listed below, reporting directly to AMC headquarters:

- Army Ballistics Research Laboratories
Aberdeen, Md. 21005
- Army Materials and Mechanics Research Center
Watertown, Mass. 02172
- Coating and Chemical Laboratories
Aberdeen, Md. 21005
- Cold Region Research and Engineering
Hanover, N.H. 03755.
- Harry Diamond Laboratories
Washington, D.C. 20438
- Human Engineering Laboratory
Aberdeen, Md. 21005
- Natick Laboratories
Natick, Mass. 01762
- Satellite Communications Agency
Fort Monmouth, N.J. 07703
- Nuclear Defense Laboratory
Edgewood, Md. 21010

The names of the major commands or separate activities are synonymous

This wide range of subjects has allowed the Navy and industry to express all facets of the simulation profession.

The future of simulation for the Defense Department, the Naval Training Device Center, and industry is very challenging. Many aspects of training are still primitive in the use of technology. However, training in the Navy is receiving more attention today than in any previous period of time. With the advanced state of operational equipment, the quality and effectiveness of what is taught and what is learned is more important than ever before. Thus, the center is looking at individual instruction. It is believed that any technique which can considerably accelerate the learning process will have a great impact on our military training programs.

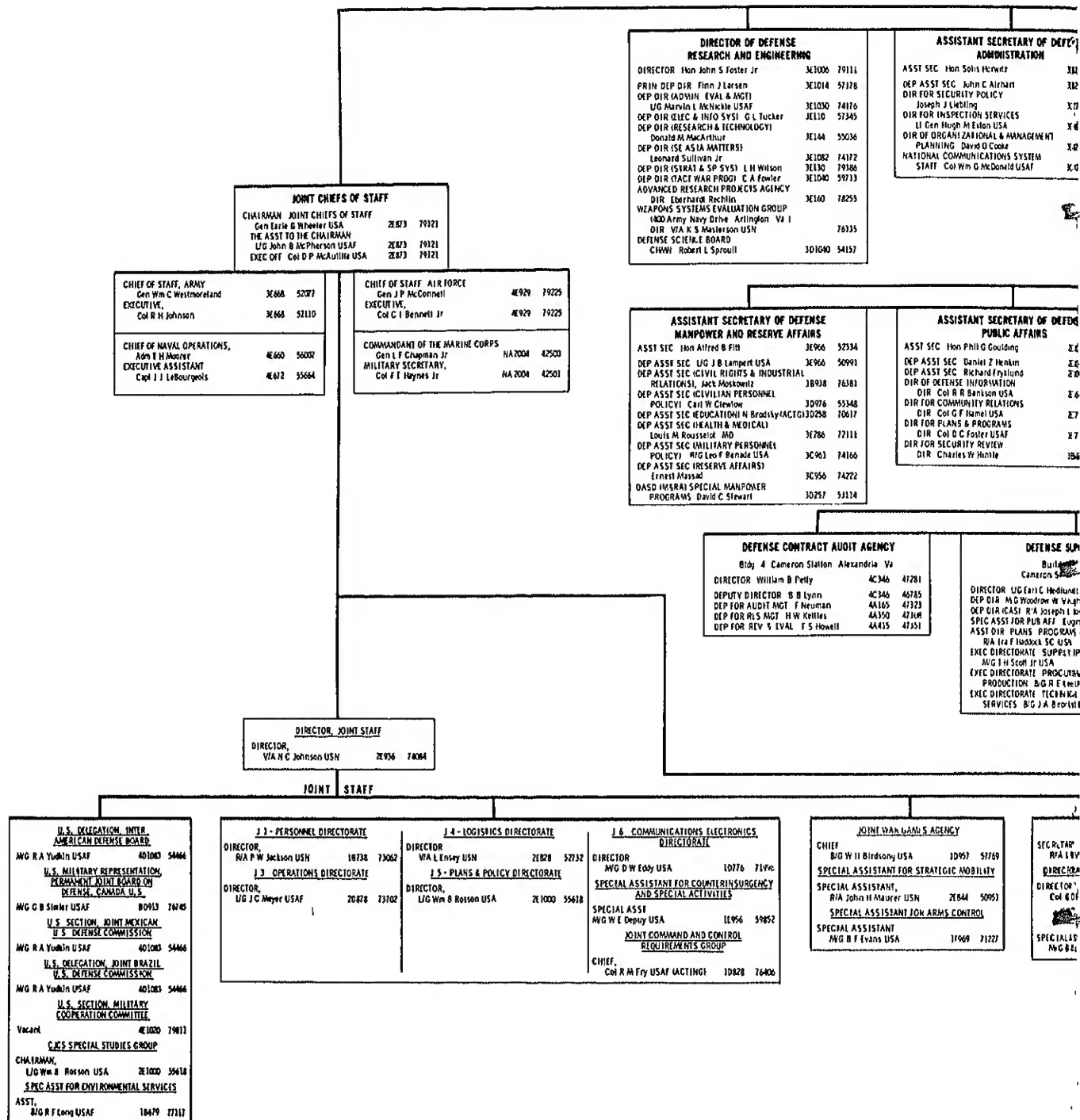
The need exists and must be satisfied by imagination, ingenuity, and technical skill.

with the commodity or commodities or function for which they are responsible with the exception of the Mobility Command, the Harry Diamond Laboratories, and the Natick Laboratories.

- The Mobility Equipment Command is responsible for aeronautical equipment, aerial delivery equipment, surface transportation, power generation, construction of surface barrier and bridging equipment, general purpose vehicles, and general support equipment and supplies.

- The Harry Diamond Laboratories are responsible for basic and applied research in the fields of radiating or influence fuzing, time fuzing (electrical, electronic, decay, or fluid), and selected command fuzing for target detection, signature analysis, and the target intercept phase of terminal guidance.

- The Natick Laboratories are responsible for research and development in the physical, biological and earth sciences, and engineering to meet military requirements in the commodity areas of textiles, clothing, body armor, footwear, organic materials, insecticides, fungicides, subsistence, containers, POL handling and dispensing equipment, materials handling equipment, food services equipment, field support equipment, tentage and equipage, and air delivery equipment.



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MEETINGS AND SYMPOSIA

SEPTEMBER

Tenth Annual Meeting of the Military Testing Association, Sept. 16-20, at San Antonio, Tex. Co-sponsors: Military Testing Association and Aerospace Medical Div. Personnel Research Laboratory. Contact: Mr. Fotis, Aerospace Medical Div., Personnel Research Laboratory, Lackland AFB, Tex. 78286, Phone (512) 674-3211, Ext. 3964.

Advanced Planning Briefing for Industry on Naval Ordnance/Missiles, Sept. 18-19, at Coronado, Calif. (Classified Secret.) Co-sponsors: Naval Material Command and the American Ordnance Association. Contact: Cdr. A. D. Sullivan, USN (Ret.), American Ordnance Association, 17th & H Streets, N.W., Washington, D.C. 20006, Phone (202) 347-7250.

Aerodynamic Deceleration Systems Conference, Sept. 23-25, at El Centro, Calif. Co-sponsors: Defense Department Joint Parachute Test Facility and the American Institute of Aeronautics and Astronautics. Contact: Earl C. Myers, 6511th Test Group Parachute, Naval Air Facility, El Centro, Calif. 92243, Phone (714) 352-6642.

American Society for Testing Materials Fall Meeting, Sept. 29-Oct. 4, at the Marriott Motor Hotel, Atlanta, Ga. Sponsors: American Society for Testing Materials, ARPA, National Bureau of Standards and NASA. Contact: Gordon Dalrymple, P.O. Box 13508, Atlanta, Ga. 30324, Phone (404) 873-2811.

OCTOBER

Government Microcircuit Applications Conference, Oct. 1-3, in Washington, D.C. (Classified Secret). Sponsors: Defense Department, NASA, Department of Commerce, National Bureau of Standards, Post Office Department and other government agencies. Contact: Mr. A.E. Cook, Office of Naval Research, Code 403C, Washington, D.C. 20360.

Silver Oxide Batteries Conference, Oct. 6-11, at Montreal, Canada. Co-sponsors: Air Force Aero Propulsion Laboratory and the Electro-

Chemical Society. Contact: Mr. J. Cooper (APIP-2), Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 52804.

Seminar on Progress and Opportunities in Military Exports, Oct. 7, at Fairmont Hotel, San Francisco, Calif. Sponsor: Electronic Industries Assn. Contact: Mrs. Jane Davis, Requirements Committee, GPD, Electronic Industries Assn., 2001 Eye St., N. W., Washington, D. C., Phone (202) 659-2200.

Twelfth Annual Organic Chemistry Conference, Oct. 8-9, at Natick, Mass. Co-sponsors: Army Natick Laboratories and NAS-NRC Advisory Board on Military Personnel Supplies. Contact: Dr. L. Long Jr., Head, Organic Chemistry Group, PRL, U.S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000 Ext. 2414.

Eighth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Oct. 8-10, at the Holiday Inn, Bordentown, N.J. Sponsor: Naval Air Propulsion Test Center. Contact: Mr. J. L. Palcza, Naval Air Propulsion Test Center, P.O. Box 176, Trenton, N.J. 08601, Phone (609) 882-1414, Ext. 317.

Matrix Methods in Structural Mechanics Conference, Oct. 15-17, at Wright-Patterson AFB, Ohio. Co-sponsor: Air Force Flight Dynamics Laboratory and the Air Force Institute of Technology. Contact: Mr. Berke, Air Force Flight Dynamics Laboratory, (FDTR), Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55651.

Silicon Carbide Second International Meeting, Oct. 21-23, at Pennsylvania State University, University Park, Pa. Sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and the Carborundum Co. Contact: Mr. C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 2234.

Explosive Chemical Reactions Seminar, Oct. 21-23, at Durham, N.C.

Sponsors: Army Research Office, Air Force Systems Command and the Naval Ordnance Laboratory. Contact: James Norman, Dir., Research-Technology Div., Army Research Office, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285, Ext. 22 or 44.

Engineering Aspects of Solidification Conference, Oct. 28-30, at Boston, Mass. Sponsors: Army Materials and Mechanics Research Center, American Society for Metals and American Foundrymen's Society. Contact: Dr. Paul J. Ahearn, Metallurgist, Army Materials and Mechanics Research Center, Watertown, Mass. 02172.

NOVEMBER

Third International Symposium on Equatorial Aeronomy, Nov. 2-10, at Ahmedabad, India. Sponsors: Office of Aerospace Research, Voice of America, Cambridge Research Laboratories and the Environmental Science Services Administration. Contact: Edwin J. Chernosky, Air Force Cambridge Research Laboratories, L.G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3714.

Reliability Physics Symposium, Nov. 11-13, at Washington, D.C. Co-sponsors: IEEE and Rome Air Development Center. Contact: Mr. J. Vaccaro (EMERP), Rome Air Development Center, Griffiss AFB, N.Y. 13440, Phone (315) 330-2813.

Fifth Annual Symposium on Science, Philosophy and Religion-Weapons Technology Conscience, Nov. 13-15, at Kirtland AFB, N.M. Sponsor: Air Force Special Weapons Center. Contact: Lt. Col. Rizzo, Air Force Weapons Laboratory (WLRP), Kirtland AFB, N.M. 87117, Phone (505) 247-1711, Ext. 2320.

Prevention of Microbiological Deterioration of Military Materiel Meeting, Nov. 19-21, at Natick, Mass. Sponsor: Army Natick Laboratories. Contact: Arthur M. Kaplan, Head, Applied Microbiology Group, PRL, Army Natick Laboratories, Natick, Mass. 01760 Phone (617) 653-1000 Ext. 2206

DOD Approves New Communications Satellites

The Defense Department has announced its decision to proceed with a program to develop and acquire new, synchronous communications satellites and new terrestrial terminals as the next phase of its Defense Satellite Communications System (DSCS).

In testimony June 18, 1968, Dr. Gardiner L. Tucker, Deputy Director of Defense Research and Engineering (Electronics and Information Systems), informed the House of Representatives Military Operations Subcommittee of the Government Operations Committee of the decision, and stated that procurement of the new satellites and development of the new terminal types would be initiated in FY 1969.

It is expected that some of the new satellites will be placed in synchronous, equatorial orbit by late 1970 or early 1971.

The new satellites are to be equipped with both "earth coverage" and "narrow beam" antennae.

The earth coverage antenna will direct most of the satellite-radiated power toward the earth, providing relatively uniform coverage of that portion of the earth visible to the satellite.

The narrow beam antennae will focus their radiated energy into a very narrow beam which illuminates an area of 1,000-2,000 miles in diameter of the earth's surface. The narrow beam antennae will be steerable, so that the beams may be directed toward any selected area of the earth visible to the satellite.

This next phase of the Defense Satellite Communications System will provide many more channels for unique and vital military needs than are provided by the initial system.

The concentration of radiated power

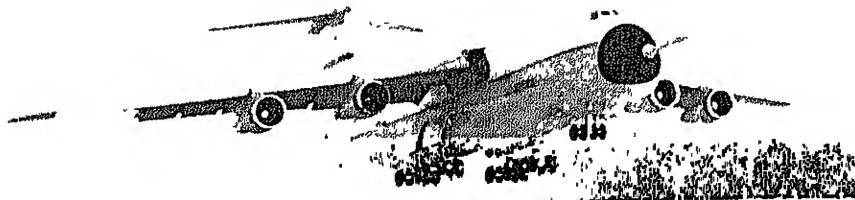
provided by the narrow beams will enable establishment of channels to transportable terminals having small antennae.

The commercial satellite and other common carrier communications systems will continue to be used for the transmission of a substantial load of routine traffic between the United States and overseas locations.

Establishment of the advanced system will be under the management of the Defense Communications Agency which will also exercise operational control over the system when it is established.

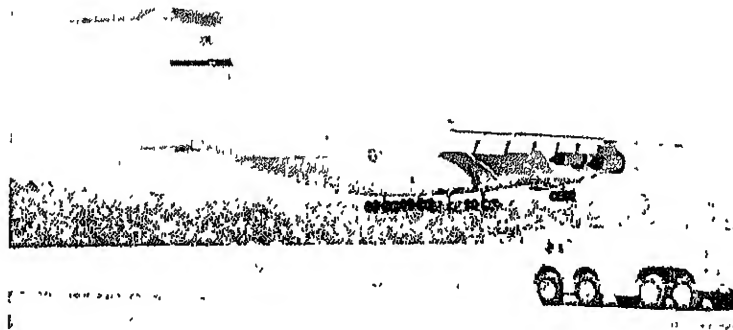
The Army will be responsible for development and acquisition of land terminals, the Navy will be in charge of development and acquisition of shipboard terminals, and the Air Force will have cognizance over the development, acquisition, launching and on-orbit control of the satellite system.

C-5A Makes 95-Minute Maiden Flight



The first Air Force Lockheed C-5A Galaxy lifts off the runway on its 95-minute maiden flight. The C-5A will meet the Air Force need to transport outsize cargo loads over intercontinental distances.

The 728,000-pound C-5A transport has a normal payload capacity of 110 tons, but under emergency conditions can lift 132 tons. The landing, like the takeoff, used only 5,000 feet of the 10,000 foot runway at Dobbins AFB, Ga.





BIBLIOGRAPHY



DEFENSE PROCUREMENT CIRCULARS

Distribution of Defense Procurement Circulars is made automatically by the U.S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

Defense Procurement Circular No. 62, July 10, 1968. (1) Selected Items Relating to DOD Procurement. (2) Material Inspection and Receiving Report (MIRR) (DD Form 250 Series).

RESEARCH REPORTS

Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche copies (65¢) or full-size copies (\$3) of the documents (unless otherwise indicated) from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Stability of Tungsten and Thorium Dispersions in Beryllium. Aerospace Corp., El Segundo, Calif., for the Air Force, Dec. 1967. 18 p. Order No. AD-664 887.

Mechanical Deterioration of MgO by Water Vapor. Aerospace Corp., El Segundo, Calif., for the Air Force, Nov. 1967. 30 p. Order No. AD-664 890.

Development of Flexible Epoxy Resins and Coatings. Olin Mathieson Chemical Corp., New Haven, Conn., for the Navy, Feb. 1968. 37 p. Order No. AD-666 293.

Utility of Quantized Models of Fading for Error Analysis. Sperry Rand Research Center, Sudbury, Mass., for the Air Force, Jan. 1968. 46 p. Order No. AD-665 135.

The Estimation of Periodic Signals in Noise. General Electric Co., for

the Navy, Feb. 1968. 33 p. Order No. AD-666 580.

Research in Energy Conversion, Northeastern University, for the Air Force, Sept. 1967. 657 p. Order No. AD-665 484.

Magnesium Round Dry Cell Batteries, Burgess Battery Co., Freeport, Ill., for the Army, Feb. 1968. 82 p. Order No. AD-666 184.

Separators for High-Rate, Non-Reserve Zinc-Silver Oxide Batteries. Douglas Aircraft Co., for the Army, Jan. 1968. 115 p. Order No. AD-665 631.

Sixth Status Report on Fuel Cells. Army Electronics Command, Fort Monmouth, N.J., May 1967. 181 p. Order No. AD-665 358.

On the Application of Small-Angle Electron Scattering to Plasma Diagnosis. Air Force Institute of Technology, March 1968. 23 p. Order No. AD-666 475.

GOVERNMENT PRINTING OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

U.S. Government Organization Manual 1968-69. Describes the creation and authority, organization, and functions of the agencies in the legislative, judicial and executive branches. Includes about 40 charts showing the organization of the Government, Senate, House of Representatives, the departments and the major independent agencies. GS 4.109:968. \$2.

MILSTRIP, MILITARY STANDARD Requisitioning and Issue Procedures, change 18, Feb. 1968. 126 p. D7.6/4: M59/ch.18. 65¢.

MILSCAP, MILITARY STANDARD Contract Administration Procedures, Change 3, Feb. 1968. 59 p. D7.6/4: M59/3/ch.3. 35¢.

M60 Machinegun. Sets forth Marine Corps doctrine, techniques and procedures for employment of the machinegun, 7.62mm, M60. Discusses mechanical training, unit organiza-

tion, marksmanship, and technique of fire. 1967. 158 p. il. D214.9/4:6-4A. \$1.

Amphibian Vehicles, Ch. 1, Nov. 9, 1967. Contains Change 1 to fleet Marine Force Manual 9-2, Amphibian Vehicles. 1967. 97 p. il. D214.9/4:0-2/ch.1. 60¢.

Air Force Scientific Research Bibliography, 1961, Vol. V. Contains abstracts of all technical reports, journal articles, books, symposium proceedings and monographs produced by the Air Force Office of Scientific Research during calendar year 1961. 1967. 1150 p. il. D301.45/19-2:700/v.5. Cloth \$6.75.

Armed Services Procurement Regulation Supplement No. 4, Procedures for Submission of Applications to be Placed on Research and Development Bidders Mailing Lists. 1968. 68 p. D1.13/2-2:4. 35¢.

Industrial Security Manual for Safeguarding Classified Information, Change 1, May 1, 1968. Contains changes to Industrial Security Manual for Safeguarding Classified Information, DOD 5220.22-M, July 1, 1966. 106 p. il. D3.6/3:S2/966/ch.1. 55¢.

Clarification

An item on the DD Form 250, "Material Inspection and Receiving Report," (*Defense Industry Bulletin*, June 1968, back cover) omitted the fact that these forms are used by all cognizant contract management offices of the Defense Department and Military Services. In the form of a reproducible hectograph master, the DD Form 250 can be used as an invoice when submitted in four copies to the administering contract management office. Supplies of the master DD Form 250 can be obtained free of charge from Defense Contract Administration Services Region offices and Military Department contract management activities.

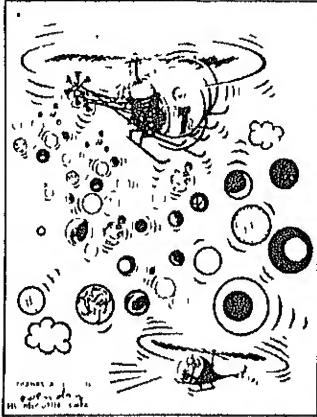
Detailed information on use of the DD Form 250 is contained in Defense Procurement Circular No. 59, dated Feb. 14, 1968, which is available from contract administration offices.

Company Program Boosts Vietnam Effort

COPTER CARTOON

by owen day

SEND COPTER CARTOON IDEAS TO OWEN DAY, PUBLIC RELATIONS



"Poor guy... done gone and lost his marbles!"

JERRY O. SHAW SPEAKS HIS MIND:

'I'm As Close To Vietnam As I Am To My Job!'



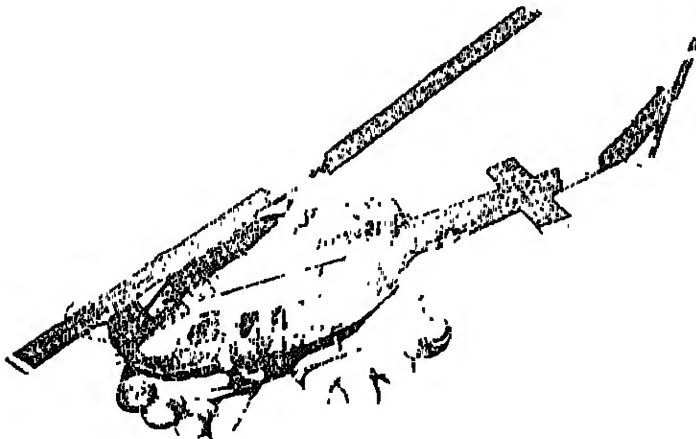
JERRY O. SHAW

Sp5 RONALD D. SHAW, 24, 126th FINANCE STATION, U. S. ARMY, IS THE BROTHER OF JERRY O. SHAW. CONTRACTUAL DATA, ENGINEERING, HURST PLANT, FIRST SHIFT. THE ARMY MAN HAS BEEN IN VIETNAM SINCE JULY, 1967. DAILY THE BELL WORKER WORKS ON THE HUEY TEAM KNOWING IN SOME MEASURE HE SUPPORTS HIS BROTHER AS ALL SERVICEMEN SERVING OUR NATION.



Sp5 RONALD D. SHAW

IN YOUR HANDS:



Many defense contractors have programs to inspire their employees to take pride in their work of supporting the war effort in Vietnam. One outstanding example is that of the Bell Helicopter Co., whose program was brought to the attention of the *Defense Industry Bulletin*.

Each week Bell Helicopter employees are reminded of their Vietnam support role when they receive their paychecks. Their pay envelopes carry a message from a fellow employee who has a relative serving in Vietnam: "I'm as close to Vietnam as I am to my job." Along with the message, the envelopes carry a picture of the employee and a biographical sketch and picture of the serviceman.

The credit for the pay envelope campaign belongs to Owen Day of the public relations department at Bell. In a letter to Bell Helicopter President Edwin Ducayet, Deputy Assistant Secretary of Defense (Public Affairs) Daniel Z. Henkin commended Day for his "thoughtful and noteworthy program."

The payroll reminder of Bell Helicopter employees' support of the Vietnam effort is part of an overall program which includes posters on bulletin boards around the Bell plant and picture stories of Huey helicopters in action in the semi-weekly Bell Helicopter News.

ASPR Committee Case Listing

The following is a listing (revised as of June 24, 1968) of the cases currently under consideration by the Armed Services Procurement Regulation (ASPR) Committee, of the Office of the Assistant Secretary of Defense (Installations and Logistics).

On items marked by asterisks, the text has been omitted to shorten the listing. The asterisks denote actions taken as shown below:

**—Case closed, no ASPR revision resulting.*

***—Case closed, approved for printing in a subsequent ASPR revision.*

****—Case closed, approved for printing subject to further government coordination.*

The listing includes subjects of interest to contractors but excludes cases of a minor or editorial nature, those considered sensitive, and those involving a deviation from the regulation which are processed by the ASPR Committee.

The ASPR Committee meets with representatives of major industry associations periodically to explain the purpose and status of each of the cases under consideration, and to answer questions from industry representatives concerning the cases. All proposed ASPR changes of major policy are forwarded to industry associations in draft form for the review and comments of the association memberships. Industry comments are evaluated by the Defense Department before a final decision on the proposal is made by the ASPR Committee.

Rental Charges for Use of Government Property. To consider whether the adoption of a policy of charging rent for use of government property, across the board, would be more practical and less burdensome in assuring against competitive advan-

tage, and would result in a decline in the number of requests for use of government property generally. No definitive action has been taken on the numerous proposed solutions to this matter. The problem is still under consideration.

Industry Cost Sharing. To consider revising the ASPR policy contained in 4-208 on industry cost sharing in connection with sales to foreign governments to provide additional policy guidance, for use in situations when the potential domestic and foreign commercial sales of the contractor appear to be very substantial and provisions for cost recovery by the Government of development expenses may be appropriate. Action on revising 4-208 has been completed. The revised coverage has been presented to higher authority for approval as a matter involving major policy.

Cost Principle—Depreciation. To review the depreciation guidelines and rules issued by new Revenue Procedures 65-13, and to prepare appropriate changes to ASPR 15-205.9 which may be necessary as a result of Revenue Procedures 65-13 issued by the Internal Revenue Service. After considering industry comments, revised coverage has been approved for printing in the 15-205.9 paragraph. However, printing of the .9 paragraph is being withheld until action to revise 15-205.32, covering "Gains and Losses on Disposition of Depreciable Property and Other Capital Assets," is complete. As a result of industry comments received on the .32 paragraph, the principle was changed to simplify both the language and the procedures for determining the gain or loss. Because of this change, the revised cost principle was again forwarded to industry for comment on May 31, 1968.

*** Environmental Pollution Control.**

Equal Employment Opportunity. To develop implementation of the Department of Labor revised rules with respect to the subject matter.

This matter is currently under consideration by a special subcommittee.

Review of the Implementation of Public Law 87-653. To undertake a review of the ASPR implementation of Public Law 87-653 in depth on the basis of the experience thus far obtained, to determine the need for further guidance or clarification of such coverage. This review has been divided into five broad areas as follows:

(a) The submission of data. When is data submitted? Submission vs. disclosure or availability. Identification of data. Contracting officer (and other) documentation.

(b) Definitions of "current" and "complete." From the standpoint of reasonableness and practicability. How should significance be considered?

(c) Examination of Records. Audit before negotiation. Audit after contract award. Audit of subcontractor data.

(d) Subcontract Problems. Subcontracts under firm fixed-price primes. Second and third tier subcontracts.

(e) Significance. From the standpoint of price negotiation vs. application of defective pricing clause. Price changes after price agreement but before contract award.

Proposed coverage on (a), (b), (c) and (e) was previously circulated to industry for comment, and the results of this effort were issued on Defense Procurement Circular No. 57, dated Nov. 30, 1967.

Proposed coverage on the subcontract aspect of this matter was forwarded to industry for comment on March 4, 1968, with a request that comments be presented by May 4, 1968. Pursuant to industry's request, the date for submission of comments was extended to July 7.

Cost Information Reports (CIR). Proposed ASPR coverage for Cost Information Reports has been developed and was approved for print by the ASPR Committee. However, printing has been withheld based

upon information that the basic DOD instruction is in the process of being changed, and that the changes contemplated will require redrafting the ASPR coverage.

Contract Modifications. To develop a new ASPR section consolidating service material dealing with all types of contract modifications. Consideration of this subject is continuing.

Handbook for Procurement Quality Assurance. To prepare an ASPR Supplement which will provide standardized procedures, where possible, for use of government inspection and quality assurance personnel. A draft of the proposed coverage is now being coordinated with the Military Departments.

Contractor Utilization of Industrial Production Equipment. To prepare procedures which will require an active government program to assure that government-furnished industrial production equipment, in possession of contractors, is being effectively utilized. The text of this case is currently being re-evaluated as a result of recent Congressional and General Accounting Office interest in the subject. This matter is still under consideration by the ASPR Committee.

**** Production Surveillance and Reporting.**

Transportation. To develop a new ASPR Section XIX covering transportation by expanding the existing Section I, Part 18, coverage to incorporate therein existing service material and thereby provide comprehensive guidance, including necessary contract clauses and provisions. Industry comments have been evaluated and the revised coverage approved subject to final editing.

Communications Services. Development of uniform ASPR coverage which would permit deletion of existing Departmental coverage with respect to procurement of communication services from both regulated and non-regulated suppliers. Industry comments have been received, considered, and revised coverage developed. Final action of this coverage has been delayed awaiting review by higher authority.

**** Cost-Plus-Award-Fee Contracts.**

Advance Understanding of Allowability, ASPR 15-107. To revise the existing ASPR paragraph to explicitly provide that such agreements must be in writing to be binding

on the Government. Proposed ASPR coverage concerning Advance Understandings on Particular Cost Items was forwarded to industry for comment on May 29, 1968. The comments received from industry and other government agencies are currently under consideration.

Compensation Review Procedures. To prepare procedures to be followed by government personnel to assure that compensation paid to contractor employees performing on government contracts is reasonable. Subcommittee report is being evaluated.

Training and Educational Costs—ASPR 15-205.44. To consider whether changes in the training and educational requirements of contractors and the manner of meeting such changes warrant a revision of the present ASPR 15-205.44. This case was initiated as a result of comments received from an Association in May 1967. Following consideration of the comments received, it was concluded in October 1967 that no change be made in the cost principle on this subject. On May 14, 1968, additional information with respect to changing the subject cost principle was presented by an Industry Association letter. This matter is currently under consideration.

**** G&A Expenses—ASPR 15-203(c).**

Help Wanted Advertising—ASPR 15-205.33. To consider revising the cost principle to define the type of recruiting advertising that is allowable. Prior to undertaking a revision of the subject cost principle, the Committee determined to seek industry assistance in an effort to obtain data which could be used in assessing the benefits of (i) institutional type advertising containing help wanted advertisements, in contrast with (ii) help wanted advertising in the classified section of the daily newspapers. A response from CODSIA providing data in this area was received on April 26 and is currently under consideration.

Technical Data Warranty. To consider the advisability of incorporating in ASPR a warranty clause for technical data. Proposed ASPR coverage with respect to the subject matter was forwarded to industry for comment on May 17, 1968.

**** Revision to ASPR Section VII.**

**** Proposed War Risks Insurance Coverage for Contractor Employees.**

**** Price Warranty Provisions in Escalation Clauses.**

Established Price Warranty Clause. To develop and prescribe the use of a "Price Warranty" provision in small purchases and other fixed price negotiated procurements, in which cost or pricing data is not obtained. Industry comments on the proposed Price Warranty provision have been received and evaluated. This matter is still under consideration.

Predetermination of Rights in Data. To reconsider the predetermination policy and its application, and determine the practical utility of the procedures and whether the procedures should be revised. Proposed ASPR coverage on the subject matter was forwarded to industry for comment on March 14, 1968, with a request that comments be presented by May 14. On May 8, 1968, pursuant to industry's request, the date for submission of comments was extended to June 14. This date was subsequently extended to June 28.

Reporting of Labor Disputes. To consider revising the coverage contained in 12-101.3, "Reporting of Labor Disputes," and the ASPR clause in 7-104.4, "Notice to the Government of Labor Disputes," to clarify and simplify the reporting of labor disputes under the subject coverage.

**** "Use and Charges" Clause, ASPR 7-702.12.**

*** Definition of Adequate Competition.**

*** Allocation of Personal Property Taxes Assessed on Commercial Work in Process to Defense Contracts.**

**** Contractor Performance Record (Supply and Equipment).**

Modification of Weighted Guidelines To Give Greater Recognition to Invested Capital. To develop a revision to the present weighted guidelines coverage to give more recognition to contractor investment.

**** Providing Contractually for the Administrative Resolution of Government Breaches.**

Purchase vs Lease; Allowability of Costs Under ASPR 15-205.34 and 15-205.48 for ADPE, Other Equipment and Buildings. To clarify 15-205.34(b) in light of the General Accounting Office report alleging improper application; revision of 15-205.48 to provide that a "price" established pursuant to 15-205.22(e) may be used for the purpose of de-

termining ownership costs of ADPE rented from an affiliate; modify 15-205.9 to insert a new paragraph (g) to clearly point out that depreciation cost basis of any equipment, including ADPE, may be at a "price" established pursuant to 15-205.22(e); modify 15-205.34 and .48 to specifically provide that "interest" and other non-allowable costs are to be included in comparing or limiting rental costs to those of ownership; and to clearly provide that "interest" is not an allowable cost. Proposed ASPR coverage with respect to the subject matter was forwarded to industry for comment on May 27, 1968.

Revision to ASPR 15-205.41—Tax-Principles on Bid and Proposal and Independent Research and Development. To solicit comments on proposed ASPR revision of Independent Research and Development (IR&D) cost principle and the Bid and Proposal (B&P) cost principle from industry associations and other government agencies. The proposed revisions to the existing ASPR cost principles on Independent Research and Development and Bid and Proposal were developed as a staff action outside of the ASPR Committee, and referred to the Committee for editing and the obtaining of industry comments. This material was forwarded to industry on Jan. 29, 1968. On March 25, 1968, the reporting date for submission of comments by industry and government agencies was extended to June 30, 1968.

Contractor Performance Evaluation (Development) Expansion. To expand the DOD program of contract

performance evaluation to include all profit contractor development contracts of \$100,000 or more. The proposed ASPR expansion in this area was forwarded to industry for comment on May 14, 1968.

Revision to ASPR 15-205.41—Tax-Principles. To develop a revision to existing ASPR cost principles to reflect Opinion No. 11 of the Accounting Principles Board of the American Institute of Certified Public Accountants that "income tax expense should include tax effects of revenue and expense transactions included in the determination of pretax accounting income." A proposed revision of the 15-205.41 paragraph to accomplish the foregoing was forwarded to industry for comment on June 10, 1968.

Preference for U.S. Flag Aircraft. To expand Section I, Part 14, to require the use of U.S. Flag air carriers in preference to foreign air carriers for international air shipment in connection with DOD contracts.

CPFF Contracts and Progress Payments for Fixed-Price Contracts, Expediting Payment. To consider suggestions received from industry to expedite payment for cost-plus-fixed-fee contracts and progress payments for fixed-price contracts.

Relocation Costs, ASPR 15-205.25. To include in the subject paragraph a new sub-paragraph (e) providing that "payment for employees" income taxes incident to reimbursement relocation costs are unallowable." The proposed addition to ASPR quoted above was forwarded to industry for comment on May 22, 1968.

SENLOG to Move to Huntsville, Ala.

The U.S. Army Sentinel Logistics Command (SENLOG), temporarily located in Washington, D.C., since it was organized last April, will be moved to a permanent site at Huntsville, Ala.

SENLOG, a major subordinate command of the U.S. Army Materiel Command, was established to provide logistical support to the Sentinel System, the Communist Chinese-oriented antiballistic missile system approved for deployment last September.

SENLOG's responsibilities include

all aspects of inventory management and maintenance engineering functions required to support the Sentinel System.

Huntsville is the location of the Sentinel System Command, the field agency of the Sentinel System organization charged with development, acquisition and installation of the antiballistic missile system.

Elements of other U.S. Army agencies involved with deployment of the Sentinel System are also located in the Huntsville area.

Brigadier General Mahlon E. Gates heads SENLOG.

Calender of Events

Sept. 16-18: American Institute of Aeronautics and Astronautics Third Space Simulation Conference, Seattle, Wash.

Sept. 23-25: American Institute of Aeronautics and Astronautics Second Aerodynamic Deceleration Systems Conference, El Centro, Calif.

Sept. 26: National Security Industrial Association Twenty-Fifth Annual Dinner, Sheraton Park Hotel, Washington, D.C.

Sept. 30-Oct. 1: American Institute of Aeronautics and Astronautics Joint Engineering Management Conference, Marriott Motor Hotel, Philadelphia, Pa.

Oct. 3: Fourth Annual Air Force/Industry Cost Reduction Awards Ceremony and Workshop, International Hotel, Los Angeles, Calif.

Oct. 13-16: National Defense Transportation Association Twenty-Third Annual Forum, Washington-Hilton Hotel, Washington, D.C.

Oct. 13-19: American Institute of Aeronautics and Astronautics Nineteenth International Astronautical Congress, Waldorf Astoria Hotel, New York, N.Y.

Oct. 21-23: Defense Supply Agency Twenty-First Annual Convention, Sherman House, Chicago, Ill.

Oct. 21-25: American Institute of Aeronautics and Astronautics Fifth Annual Meeting and Display, Civic Center, Philadelphia, Pa.

Oct. 28-30: Association of the U.S. Army National Meeting, Sheraton-Park Hotel, Washington, D.C.

Nov. 6-8: American Institute of Aeronautics and Astronautics Conference on Composition and Dynamics of the Upper Atmosphere, University of Texas at El Paso.

Nov. 18-20: American Petroleum Institute Annual Convention, Hilton Hotel, Chicago, Ill.

Nov. 19-22: American Institute of Aeronautics and Astronautics Third International Symposium on Basic Environmental Problems of Man in Space, Geneva, Switzerland.

Dec. 2-4: Institute of Electrical and Electronics Engineers 1968 Reliability Physics Symposium, Washington, D.C.

Dec. 3-5: American Institute of Aeronautics and Astronautics Entry Vehicle Systems and Technology Conference, Williamsburg, Va.

Management Counseling for Small Business

Clyde Bothmer

[Editor's Note: This is the third in a series of articles intended to bring small and big business readers up to date with the programs of the Small Business Administration. The author, Clyde Bothmer, is Deputy Associate Administrator of the Small Business Administration.]

There are over 5 million small businesses in the United States today. They range from one-man operations to sophisticated small manufacturing concerns. In this highly competitive society, many of these firms fail. Dun and Bradstreet, analyzing the cause of business failures, found that 9 out of 10 firms fail due to managerial problems. Their figures also show that 50 percent of new small businesses failed before they were two years largely because of management. The most common reasons for these business failures are:

- Lack of qualifications to run a business.
- Lack of training as manager.
- Improper pricing of products and not buying at the best price.
- Poor selling programs.
- Inadequate records.

Since it is established policy of the Congress that "the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small business concerns," and since the Small Business Administration (SBA) was created to carry out the policies declared in the Small Business Act, the SBA is vitally interested in providing to the management the information and training which will help reduce the mortality rate of small businesses. Several methods are used, falling into three general programs of the SBA Office of Procurement and Management Assis-

tance: the education program, which will be discussed in the next article of this series; the local counseling program, maintained by the professional staff of SBA; and an in-depth assistance program, dependent on the volunteers of the Service Corps of Retired Executives (SCORE).

The present broad-gauged management assistance programs originated in a support function of early loan programs. One of the principal functions of SBA in 1953-54 was considered to be the provision of financial advice to small businesses, and such advice often veered to management problems which were the real source of financial difficulties of small firms. The advisors at that time were the financial specialists in the various field offices. There was some assistance available for those with problems relating to government procurement, production problems, material and equipment, and new products. In terms of the management functions of planning, directing, controlling and supervising, however, there was no personal counsel available from SBA.

By 1955, SBA was responding to some of the requests for individual assistance, although most of the inquiries were referred to reliable sources of assistance outside of the agency. About 1,100 specific requests were answered by correspondence from the central office in Washington, D.C. A small number of assistance cases was also handled by various field offices on a non-regulated, individual case basis. Gradually as the need and demand for personal help increased, recognition of the responsibility to provide this type of service grew. The increased demand for such aid also pointed up the impracticalities of counseling the nation's small businessmen from Wash-

ington. Counseling on individual problems was accepted as a function of the field offices.

While this shift was taking place, a change of emphasis was occurring in the type of counseling required. Originally, the principal interest of those seeking SBA guidance was to obtain information on starting a business. This demand did not slacken. In fact, it increased to the point that the most practical approach became the scheduling of special programs (now called Workshops for Prospective Small Businessmen) which would satisfy the general needs of groups of individuals planning to establish a business enterprise.

For many, the problems of owning a business and the magnitude of the responsibility involved become apparent for the first time in these workshops. Frequently, participants realize that they are not suited to those problems and responsibilities, and save their capital and personal investment by forgetting the idea. SBA considers that its functions is no less validly performed if those slated to fail are diverted. Other participants are encouraged to plan more seriously and more effectively by an early recognition of the prospective difficulties. Hopefully, that additional planning will reduce the potential for failure of the new business. This increased assistance to those starting out contributed to the expansion of SBA counseling to a more broadly based approach. Those who succeeded in their new businesses were familiar with SBA and accustomed to its services. They joined with other businessmen to seek help in expanding, improving and developing their enterprises.

SBA recognized its obligation not to desert those it had helped to

launch and, thus, the further increase of workshops, conferences and seminars was imperative. For those in the early stages of their businesses, the common and basic topics of record keeping, pricing, credit terms, collections, etc., were incorporated into one-day conferences in order to convey information to a maximum of those concerned with a minimum of impact on the time of the SBA staff. Other conferences centered on problems unique to a given industry. Special clinics on single subjects, common to a group of participants, were used. None of this "group counseling" lessened the need, demand, or desirability for individual assistance. The time of the SBA counselor or spent on problems shared by all was reduced, and the concentration on individual and specific problems continued to grow. Once again, the number of those who had been familiarized with SBA programs increased and the demand for additional personal service grew with it.

By 1960, the number of management counseling cases had reached approximately 12,000 per year. In 1962, there were 16,000 counseling cases on management problems. During the same year, there were also 601 completed units of management courses, with a participation of 15,388. The total of individual cases reached 38,000 in 1966.

In the middle of 1967, SBA re-examined the entire management counseling program in the light of experience. There was no question that the program was fulfilling a genuine need; the past indicated that the future could only be busier. Therefore, the program was restructured to broaden its offerings and to increase the availability of its benefits to the public. Adhering to modern communications methodology, SBA selected an acronym title for the "new look" of the program—CALL (Counseling At Local Levels).

This new look meant that SBA expressly expanded the scope of management counseling to include any phase and facet of establishing, purchasing, operating, merging, relocating and liquidating a small business. Emphasis was placed on the mandate to seek out the client in need of or desiring assistance, instead of waiting in an office for

the businessman to initiate the case. This policy of seeking out potential clients is an important factor in the effort which SBA is making to give more timely aid to small businesses in danger of default on a government contract (discussed in previous article).

Since assistance and counseling is dependent upon the management assistance officers (MAOs) in regional and branch offices, the MAOs have been given increased freedom in planning, scheduling and publicizing their visits to communities in their assigned sphere. The MAOs are circuit riders in a sense, making themselves available on a regular basis to areas of need, rather than saturating the immediate environs of the regional or branch offices. From a business point of view, we might say that they are opening up new markets. During the first year of this approach to the program, the 135 MAOs in the 72 field offices of SBA have logged over 89,000 personal counseling cases and more than 2,500 units of training, with an attendance in excess of 84,000.

The efforts of the MAOs do not show, however, the entire story of the management assistance available through SBA. As is evident from the figures cited, the SBA carries a large load in the organization of group counseling and a substantial responsibility to help individuals work out particular difficulties of their businesses. Many times, however, the owner of a small business will not be certain what his problem is. Low profits are a symptom of the real illness, but the manager may lack the experience or specific business knowledge to reduce his general trouble to specific problems.

A large corporation may call in professional management consultants to identify difficulties and to suggest solutions, or a "trouble-shooter" staff may be a regular part of the organization. The small firm, however, is unlikely to have the capital or the human resources for either course. SBA could send MAOs to survey these small firms but the consumption of their time on such surveys would limit the assistance program severely. Additionally, the odds would be heavily against the SBA representative possessing experience in the specific industry being surveyed; the experience

factor is not a *sine qua non*, of course, but certainly valuable in the situation described. Finally, it must be remembered that the MAOs are not intended to fulfill the role of specialized management consultants. The wide variety of problems and the broad scope of business difficulties confronted in an individual counseling situation preclude the development of specialized expertise. For those reason and others, SBA and the small businessman are both fortunate to be able to tap one of the nation's heretofore neglected resources: the knowledge and experience of retired managers.

The Service Corps of Retired Executives (SCORE) was founded in 1964 to create an executive talent pool which could serve the nation's small business community. It provides expert management counseling at practically no cost to the client, and was formed solely to aid the "little guy" who had no place to turn. The talent comes from retired business executives who donate their time. They represent every industry and profession including lawyers, bankers, retailers, economists, plant managers, and—naturally—former owners of every type of small business. SBA is making a particular effort at present to increase the enrollment of retired scientists, engineers and technologists.

Although SBA is the sponsor of the organization, SCORE is operated by the membership. The members of the 184 chapters, operating under chapter charter and by-laws, elect their own officers for administration of the chapter. Each group maintains a roster of volunteers for the daily operation of an office. In cities where there is an SBA field office, a chapter may use that office and obtain clerical help and administrative support from SBA. But in cities outside the SBA network, chapters must find their own space and supply their own clerical help. SBA assists in obtaining the facilities and services which are usually donated by the local Chamber of Commerce or a public spirited businessman.

When a SCORE chapter is founded, the attendant publicity lets businessmen of the area know that SCORE counseling is available and

where to seek it. There is also a continuous effort by the SBA to inform the public of the program and to make its purposes known.

Acceptance of small firms as SCORE clients is dependent on two things: the ability of the SCORE chapter to provide the assistance needed and the eligibility of the applicant. Any firm with less than 25 employees is eligible, regardless of its association, or lack of same, with other SBA programs. Occasionally, other small businesses with particular problems which are brought to the attention of SBA management assistance personnel may be referred to SCORE. Some small firms call for SCORE review simply to get a fresh slant on operations and, perhaps, make a successful business even more profitable. SCORE is also available to prospective business owners. The SCORE volunteer can aid the man who is thinking about going into business by helping him plan soundly for his new venture.

After referral by SBA, the SCORE chapter will match the owner's need to the expertise of the appropriate volunteer. The volunteer who receives the case will himself arrange for appointments and visit the client at his place of business to make on-the-spot observation, to discuss goals and methods, and to present his analysis and suggestions. If necessary, he may call in other SCORE experts. The counselor's time for this service is free. SBA does ask the businessman who uses SCORE to reimburse the expert for his expenditures, such as travel on the assignment. Otherwise, the expert serves without fee.

Recently, in an effort to make an objective evaluation of the program, SBA obtained opinions from 704 small business owners and managers who had received SCORE counseling. Replies to questionnaires were received from approximately 350 cities in 28 states.

Four questions were asked concerning the advice and suggestions offered by the SCORE counselors, and approximately 80 percent of the counselors were reported as providing suggestions which two out of three clients planned to heed. In response to a question on the actual results of the service, more than twice as many businessmen reported their

businesses had improved as those who reported no improvement. One-third of the firms had employed more people after counseling, and 37 percent had lowered their costs of operation. Almost half had realized more profit. When asked for an opinion on the worth of the assistance by the SCORE advisers, 60 percent rated them as very high or adequate to the job. An additional 20 percent reported that it was too soon to evaluate the efforts of the advisers. In total, the results of the study were highly encouraging to SBA—a vote of confidence in the program.

DOD Sets Fall Dates for Procurement Conferences

Industry and small business representatives will be given a chance to become acquainted with Federal procurement and contract processes at a series of defense procurement conferences to be held this fall.

The Procurement Conference Program is part of the Defense Department's continuing effort to develop additional competitive sources, large and small, to meet defense needs.

During the conferences, businessmen and potential contractors are provided an opportunity to meet specialists on business opportunities representing the Army, Navy, Air Force and the Defense Supply Agency.

Counselors will be on hand to explain the activities of the Defense Contract Administration Services, the Defense Documentation Center, the Defense Specification Center, and other DOD organizations concerned with prime and subcontracting.

In addition to Defense Department representatives, officials from other Federal agencies will participate in specific conferences which relate to their activities.

Information contacts for the fall series of Procurement Conferences are:

Sept. 5. St. Louis, Mo. Contact: Dr. Garland R. Hadley, Exec. Vice President, St. Louis Regional Industrial Development Corp., Pierre La Clede Building, 7741 Forsyth Blvd., St. Louis, Mo. 63105, Phone (314) 726-6654.

Sept. 9. Rochester, Minn. Contact: Eugene J. Slama, Rochester Cham-

All of this management assistance and counseling is directed to the small businessman, and it may appear of no consequence at all to the nation's industrial giants. Yet, there is a relationship. It would be a glittering generality to say that this effort contributes to a stronger national economy; but if we consider that these small firms are both suppliers and consumers for those same giants, their efficiency and economic stability is obviously desirable. The management counseling programs will help to make them effective sources of supply and dependable practices."

ber of Commerce, 212 First Ave., S.W., Rochester, Minn. 55901, Phone (507) 289-4546.

Sept. 13. Denver, Colo. Contact: Washington Office of Representative Donald G. Brotzman, Room 1713, Longworth Building, Washington, D.C. 20515, Phone (202) 225-2161.

Sept. 18. Van Nuys, Calif. Contact: Julian Ross, Defense Supply Agency, Cameron Station, Alexandria, Va. 22314, Phone (703) 974-6471.

Sept. 26. Yakima, Wash. Contact: John E. Means, Washington Department of Commerce and Economic Development, 312 First Ave., N., Seattle, Wash. 98109, Phone (206) MU 2-3792.

Oct. 3. Lubbock, Tex. Contact: Grey Lewis, Lubbock Chamber of Commerce, P.O. Box 561, Lubbock, Tex. 79408, Phone (806) 768-4666.

Oct. 21-23. Chicago, Ill. Contact: Lloyd Norris, Dir., Management Training and Communications Div., Chicago Association of Commerce and Industry, 30 W. Monroe St., Chicago, Ill. 60603, Phone (312) FR 2-7700.

Oct. 30. Louisville, Ky. Contact: Bill Stratton, Exec. Asst. to the Commissioner, Kentucky Department of Commerce, Frankfort, Ky. 40601, Phone (502) 564-3408.

Dec. 1. Los Angeles, Calif. Contact: George C. Tolton, Asst. for Small Business, Defense Contract Administration Services, Cameron Station, Alexandria, Va. 22314, Phone (703) 974-7605.

DDC Explains Policy Changes

Two major changes in policy have been instituted at the Defense Supply Agency's Defense Documentation Center (DDC) since publication of an article describing the services of the center (see article "Programs and Services of the Defense Documentation Center," Defense Industry Bulletin, April 1968, page 1). The changes pertain to a service charge levied for paper copies of certain technical reports, and the granting of limited access to the center's Research and Technology Work Unit Information System to non-government organizations registered for DDC services.

The article in the Bulletin and the policy changes have generated considerable interest in DDC programs, as well as a myriad of questions concerning the services available to the Federal research and development community. The following questions, with answers, should clarify misconceptions of the center's programs and the changes in these programs.

Service Charge

Q. Is the service charge for requesting certain paper copies of technical reports applicable to military components and other Federal agencies?

A. Yes. The service charge applies to all user organizations registered with DDC.

Q. Does the service charge for paper copies of technical reports requested of DDC apply to all titles?

A. Only those technical reports for which microfiche copies are also available will be subject to the \$3 service charge. Documents stored at the center on microfilm (generally unclassified/unlimited documents accessioned before August 1964 and other reports added to the collection prior to August 1965) will be reproduced and supplied without charge to the user. A handy reference card, listing the AD (control) numbers of technical reports for which the service charge is applicable, is available from the center (attention DDC-LC). The listing was published in the May 6, 1968, issue of the "DDC Digest."

Q. How are users to pay for those technical reports which are subject to the \$3 service charge?

A. Requests for these documents must be accompanied by payment and sent to the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce,

Springfield, Va. 22151. The Clearinghouse provides two efficient methods of payment: the Prepaid Coupon System and the Deposit Account Coupons System. Use of either of these systems reduces the processing times for report requests. The Clearinghouse will accept checks or money orders as payment for the reports.

Q. Are any other charges assessed for DDC services?

A. No. The only charge assessed for DDC services is for paper copies. However, offset masters of technical reports are considered paper copies, and are subject to special service charges. The cost of offset masters will be determined according to the number of pages to be produced, and through arrangements between the requesting activity and DDC.

Contractor Access to Data Bank

Q. When will the Research and Technology Work Unit Information System (R&TWUIS) be opened to the contractor, subcontractor and grantee users of DDC services?

A. Limited access to this data bank (R&TWUIS) became available to defense contractors, subcontractors and grantees effective July 1, 1968.

Q. Are there any restrictions concerning the limited access granted defense contractors, subcontractors and grantees to the R&TWUIS?

A. These registered users must be located within the continental limits

of the United States, Hawaii, or Alaska. In addition to security considerations, the source may determine if limitations should be placed on the work unit descriptions to restrict their distribution. Access to classified information in the R&TWUIS will be similar to access for classified technical reports.

Q. Will access to the R&TWUIS terminate at the expiration of a contract or grant?

A. Yes. Access to this resource terminates at the expiration of a contract and no information can be provided after that date. To provide response time within the eligibility period, requests must be received at DDC at least 10 days prior to the expiration date on the DD Form 1540, "Registration for Scientific and Technical Information Services."

Technical Report Announcements

Q. Why does DDC provide only a single subscription to the "U.S. Government Research and Development Reports" (USGRDR) to organizations registered for service?

A. The Defense Department bears the cost of providing the single subscription to the USGRDR to the organizations registered for DDC services. Additional subscriptions to this periodical, which contains announcements of research reports in the public domain from the Defense Department and other government agencies, may be purchased directly from the publisher, the Commerce Department's Clearinghouse.

Q. How may an organization contributing reports to DDC learn the control (AD) numbers assigned to those reports prior to their announcements?

A. Contributors may be notified of the DDC control numbers assigned the technical reports more quickly by including DDC Form 50, "DDC Accession Notice," with each report submitted. As soon as the AD number is assigned to the document (an initial

effort in processing the report), the number is noted on the form, which is immediately returned by mail to the source. Contractors should submit two copies of DDC Form 50; one addressed so as to be returned to the contractor, the other to be mailed to the government sponsoring agency.

Report Collection

Q. Are technical reports accessioned by DDC retained permanently?

A. Almost every document ever accessioned by the center or its predecessor organizations is still available in the collection. Some 60,000 were retired to the files of the National Aeronautics and Space Museum when their value became more historic than scientific.

An advantage of this system of permanent retention was dramatically illustrated following a fire at the University of Miami Marine Science Institute in December 1967. Research papers produced during 17 years of study were destroyed. However, those reports which were submitted to DDC were reproduced and supplied to the Institute to partially reconstitute the collection. The incident likened the reports accessioned by the center to U.S. Savings Bonds—once submitted, they can be restored if lost or destroyed.

Q. DDC's collection of technical documents was reported to exceed 850,000 titles. Why isn't the collection purged of the older titles so that it would reflect only the latest findings or discoveries?

A. A chemical formula derived many years ago may still be the key to removing the mystery surrounding a current project. If the collection had been purged of the older documents, many technical reports on conventional warfare would have been discarded, and these are the reports being requested for use in studies relating to warfare in Vietnam. Area studies pertaining to the Far East are requested in large numbers even though the studies were performed prior to or during World War II. Having these reports available has saved valuable research time, talent and dollars. If the reports were not available, the work would have to be duplicated, and in most instances at costs much greater than the original studies.

Q. Are non-government user organizations required to return tech-

nical reports acquired from DDC at the termination of contracts?

A. Documents should never be returned to DDC unless specifically requested by the center; such recalls are rare. The costs of sorting, re-filing and storage of returned documents are prohibitive to the center. From the user's viewpoint, there is the expense of packaging and postage, especially in the return of classified reports. When the user organization determines that there is no longer a need for the reports, they should be disposed of in accordance with instructions in the DOD Industrial Security Manual.

Computer Vocabularies

Q. Is it necessary to use the terms from the DDC computer vocabulary in requesting a bibliography?

A. DDC prefers that the problem or project for which a bibliography is being requested be described in the requester's own language. The description should be presented in clear, concise terms, in short, direct sentences. The request should be as specific as possible—tell DDC what information you want, what information you don't want, and the purpose of the bibliography. The name and telephone number of the person who will use the information is an important requirement on the request form. If necessary, a DDC bibliographer will call that individual, collect, to get specific information or to alert him if the computer printout is expected to be extensive. The center's bibliographers will convert the request into a computer search strategy, using thesaurus terms and other modes to retrieve the titles which are most relevant to the subject, problem, or project.

Q. The April 1968 issue of the *Bulletin* carried an item on the DOD "Thesaurus of Engineering and Scientific Terms." When will this vocabulary be made available?

A. Publication of this thesaurus, referred to by the acronym TEST, is well behind schedule due to difficulties in printing the vocabulary on new and highly sophisticated computer-controlled equipment. According to the Office of Naval Research, which has sponsored its development, TEST will be produced during the fall of 1968 and the availability will be announced widely in DOD and other publications.

Potential Defense Contractors Program

Q. Will DDC provide continuous service to contractors during intervals between contracts, or does service terminate when no contract or grant is in effect?

A. Under normal registration policies, service terminates at the expiration of the contract for which service is being provided. However, if a contractor is involved in research and development efforts which generate contracts with the Military Departments, it would be to the contractor's benefit to seek military sponsorship under the Potential Defense Contractors Program. Participation in this program would entitle the contractor to continuing service independent of a contract or grant.

Q. What procedures should be followed to determine if an organization may be eligible for DDC services under the Potential Defense Contractors Program?

A. The organization should first determine which of the Military Departments would have the greatest interest in its research efforts. Contact should then be made with that Military Department to seek sponsorship. The military programs and points of initial contact are:

Air Force Technical Objectives Document Release Program
Headquarters, Air Force Systems Command
ATTN: SCTL
Andrews Air Force Base
Washington, D.C. 20331

Army Qualitative Development Requirements Information Program
Commanding Officer
Frankford Arsenal
SMUFA—A2100, Bldg. 65-1
Bridge & Tacony Streets
Philadelphia, Pa. 19137

Department of the Navy/Industry Cooperative R&D Program
Chief of Naval Operations
(OP-07T)
Washington, D.C. 20350

Microfiche Equipment

Q. Where may additional information be obtained concerning microfiche equipment costs, space requirements, and other characteristics?

A. For the latest information available on microfilm and microfiche

equipment, a limited supply of two booklets entitled, "A Buyer's Guide for Microfilm Reader Evaluation" and "A Survey of Microfiche Readers and Reader-Printers Currently Manufactured in the United States," is available from the Defense Documentation Center (attention: DDC-TSR-1), Defense Supply Agency, Alexandria, Va. 22314. Copies of these booklets may also be requested from the Executive Secretary, National Microfilm Association, P.O. Box 386, Annapolis, Md. 21404.

A NASA report entitled, "The Introduction of Microfiche for Disseminating Technical Information in the United States," is available from the Clearinghouse. List price is \$3 for paper copy; 65 cents for microfiche.

Use of IACS

Q. How do organizations registered with DDC avail themselves of services offered by Federally-sponsored Information Analysis Centers (IACs)?

A. A listing of Information Analysis Centers supported by the Federal Government (PB 177 050), prepared by the COSATI Panel on Information Analysis, is available from the Clearinghouse for Federal Scientific and Technical Information. DOD and other government agency contractors and grantees, interested in the services of a specific center, should contact that center directly. In general, all DDC-registered users are eligible to make use of these Information Analysis Centers.

Pertinent Directives

Q. Which DOD directives or instructions are most pertinent to the DOD Scientific and Technical Information (S&TI) Program?

A. DOD directives and instructions which most directly relate to the DOD S&TI Program are listed in Figure 1. Regulations of the Military Departments, which implement the DOD directives, are shown in the column on the right. Copies of the DOD directives and instructions are available, one copy per request, from the Naval Supply Depot, Attention: Code 300, 5801 Tabor Ave., Philadelphia, Pa. 19120.

Informational Services Available

Q. Does DDC provide informational materials for use in indoctrinating personnel within the organizations registered for service?

A. The center has a variety of brochures, pamphlets, feature article reprints, and other materials for this purpose. Requests for supplies of these handout items should be submitted to the center marked to the attention of DDC-LC. In addition, arrangements can be made for a member of the Field Liaison Staff, DDC Office of Customer Relations, to visit the user or potential user organization to brief its personnel on the center's programs and services.

DIRECTIVES AND REGULATIONS

*DOD Directive or Instruction	Implementing Service Regulations
DOD Instruction 3200.8, 7 March 66, "Standards for Documentation of Technical Reports under the DOD Scientific and Technical Information Program"	(AR 70-31, 9 September 66, (Change 1, 12 February 67 (Change 2, 20 July 67 (SECNAVINST 3200.29A, 14 June 66 (AFR 80-29, 18 May 64 (AFR 80-29A, 1 January 66 (AFR 80-29B, 5 August 66 (AFR 80-29, 18 May 64 (AFR 80-29A, 1 January 66
DOD Directive 5100.36, 31 December 62, "DOD Technical Information"	(AFR 80-29B, 5 August 66 (AR 70-45, 18 August 65 (SECNAVINST 3900.20, 1 February 63 (Change 1, 7 January 65
DOD Instruction 5100.38, 29 March 65, "Defense Documentation Center for Scientific and Technical Information (DDC)"	(AR 70-11, 8 October 65 (SECNAVINST 3900.24A, 4 August 65 (AFR 80-29, 18 May 64 (AFR 80-29A, 1 January 66
DOD Instruction 5100.45, 28 July 64, "Center for Analysis of Scientific and Technical Information"	(AR 70-22, 14 January 65, (Change 1, 4 May 67 (SECNAVINST 3900.31, 13 October 64 (AR 70-31, 9 September 66 (Change 1, 12 February 67
DOD Directive 5200.20, 29 March 65, "Distribution Statements (Other than Security) on Technical Documents"	(Change 2, 20 July 67 (NAVMATINST 4000.17, 9 June 65 (Change 1, 30 December 65 (Change 2, 6 June 67 (AFR 310-2, 12 July 65 (AFR 310-2A, 14 September 66
Change 2, 8 May 67	
DOD Instruction 5200.21, 1 September 65, "Certification for Access to Scientific and Technical Information"	(AR 70-21, 21 February 66 (SECNAVINST 3900.35, 5 January 66 (AFR 80-29, 18 May 64 (AFR 80-29A, 1 January 66 (AFR 80-29B, 5 August 66

* As of 7 December 1967

Figure 1.

Education with Industry Symposium in Seattle

The Air Force Institute of Technology and The Boeing Co. will co-sponsor an "Education with Industry" symposium to orient and motivate 107 Air Force officers to their new assignments in 40 civilian-type jobs in defense contractors' plants. The officers and companies' representatives will meet in the Hyatt House, Seattle, Oct. 8-10. Contacts are: Walter H. Koo, Staff Assistant to the President, The Boeing Co., Mail Stop 1800, P.O. Box 3707, Seattle, Wash. 98124, phone (206) 655-5683; and Lieutenant Colonel Frank S. Raggio, Air Force Institute of Technology (AFIT-CIP), Wright-Patterson AFB, Ohio 45433, phone (513) 255-3151.



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of July 1968.

DEFENSE SUPPLY AGENCY

- 1—Oregon Freeze Dry Foods, Albany, Ore. \$7,000,542. 9,120,060 food packets for long range patrols. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2001.
- S-M Vacu-Freeze Corp., Bartow, Fla. \$1,185,143. 1,620,010 food packets for long range patrols. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2002.
- 3—Trenton Textile Engineering & Manufacturing Co., Trenton, N.J. \$2,238,742. 701,800 collapsible five-quart canteens. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2472.
- Eastern Canvas Products, Haverhill, Mass. \$1,066,744. 881,800 ammunition cases. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2778.
- Swiftlik Parachute Co., Trenton, N.J. \$1,024,714. 60,850 tropical lightweight nylon ruck sacks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2782.
- Westinghouse Air Brake Co., Peoria, Ill. \$1,548,688. Earthmoving scrapers. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9823.
- International Airport, El Paso, Tex. \$1,826,400. 8,600,000 gallons of JP-4 jet fuel and servicing. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2310.
- 5—Zeks Industries, Malvern, Pa. \$1,125,233. 604 air conditioners and data. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9851.
- Pascoe Steel Corp., Pomona, Calif. \$1,529,310. 750 prefabricated, ready-cut metal buildings. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9850.
- Butler Mfg. Co., Kansas City, Mo. \$1,526,250. 750 prefabricated, ready-cut metal buildings. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9857.
- 16—Ziegler Co., Milwaukee, Wis. \$1,851,687. 40,780,500 candy-coated discs for use in combat rations. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2034.
- Swiftlik Parachute Co., Trenton, N.J. \$1,024,714. 60,850 tropical lightweight nylon ruck sacks, with three small liners and one large liner. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2787.
- 18—Interstate Bakeries Corp., Kansas City, Mo. \$1,121,632. 10,195,684 cans of baked items for use in combat rations. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2040.
- Morton House Kitchens, Inc., Nebraska City, Neb. \$1,028,524. 6,796,992 cans of baked items for use in combat rations. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2041.
- 10—Tony Downs Foods, St. James, Minn. \$2,185,013. 6,796,896 cans of beans with spiced sauce. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2068.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting Agency—Contract Number.

- Blue Star Foods, Council Bluffs, Iowa. \$2,095,205. 6,796,896 cans of beef steak. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2054.
- Phipps Products Corp., Boston, Mass. \$1,547,432. Various quantities of petrochemical items. Defense Fuel Supply Center, Alexandria, Va. DSA 640-68-D-0148.
- 23—Oscar Mayer Co., Madison, Wis. \$4,455,530. 6,796,896 cans of sliced ham and 6,796,896 cans of sliced pork. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2055.
- Tony Downs Food Co., St. James, Minn. \$2,926,796. 6,796,752 cans of spaghetti with ground meat and 3,796,752 cans of beef slices with potatoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2066.
- F&M Trim Shop, Newburgh, N.Y. \$3,372,824. 463,300 poncho liners. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0127.
- Consolidated Foods Corp., Cambridge, Md. \$1,115,700. 6,796,752 cans of beans with frankfurter chunks in tomato sauce. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2056.
- 25—Texaco, Inc., New York, N.Y. \$2,410,720. Premium and regular gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2360.
- Standard Oil Co., San Francisco, Calif. \$1,590,951. Fuel Oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2359.
- 26—Granite State Canning Corp., Manchester, N.H. \$1,636,372. 6,796,752 cans of meatballs with beans in tomato sauce. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2075.
- Foremost McKesson, Inc., San Francisco, Calif. \$1,268,271. 15,187,024 cans of cheddar cheese spread. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-2080.
- 31—General Foods Corp., White Plains, N.Y. \$1,060,318. 1,689,600 800-gram units of rice. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-M009.
- bomb production plant and support services at the Army Ammunition Plant, Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0383.
- Apex Building Constructors, Newport News, Va. \$1,127,000. Construction of two 200-man dormitories at Langley AFB, Va. Engineer Dist., Norfolk, Va. DA CA65-68-C-0184.
- I.B.M. Corp., Gaithersburg, Md. \$2,117,507. A combat services support system (CS3) logistics data processing subsystem. Washington Procurement Div., Electronics Command, Alexandria, Va. DA AB07-67-C-0408.
- Johnson & Son, Inc., Minneapolis, Minn. \$1,228,000. Construction of 200 and 600-meter testing ranges at the Army Ammunition Plant, Minneapolis, Minn. Engineer Dist., Chicago, Ill. DA CA23-69-C-0091.
- 2—Fred R. Comb Co. and Steenberg Construction Co., Minneapolis, Minn. \$2,327,100. Construction of four 200-man dormitories. Chanute AFB, Ill. Engineer Dist., Chicago, Ill. DA CA68-C-0094.
- Martin Marietta Corp., Orlando, Fla. \$24,595,300. \$2,025,272 Pershing ground support equipment. Army Missile Command, Huntsville, Ala. DA AH01-68-C-1628 and DA-AH01-68-C-1961.
- 3—Goodyear Tire & Rubber Co., Akron, Ohio. \$1,716,484. 12-ply pneumatic tires for five and ten-ton trucks. Gadsden, Ala. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0096.
- Firestone Tire & Rubber Co., Akron, Ohio. \$9,196,510. T130 truck shoe assemblies for M113 personnel carriers. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0017.
- Uniroyal, Inc., Detroit, Mich. \$1,079,125. 12-ply pneumatic tires for five and ten-ton trucks. Los Angeles, Calif. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0005.
- 5—Wetmore & Farman, Inc., Jackson, Miss. \$1,233,859. Construction of a shop building and warehouse. Vicksburg, Miss. Engineer Dist., Vicksburg, Miss. DA CW38-69-C-0004.
- Raytheon Co., Andover, Mass. \$2,197,652. Repair and overhaul of 148 major items of the Hawk missile system. Army Missile Command, Huntsville, Ala. DA 01-021-AMC-14159 (2).
- Hercules, Inc., Wilmington, Del. \$2,240,491. Support services and operation of an ordnance production facility. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. DA W-11-173-AMC-00037 (A).
- Hercules, Inc., Wilmington, Del. \$2,007,513. Support services and operation of a propellant producing facility. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00042 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$5,123,426. Support services and operation of an ammunition producing facility. Charleston, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00097 (A).
- Remington Arms Co., Bridgeport, Conn. \$2,397,563. Operation of a government-owned facility for production of small arms ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 49-016-AMC-00003 (A).
- Uniroyal, Inc., New York, N.Y. \$3,476,162. explosives, and for loading, assembling and packing of medium and large caliber items. Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00062 (A).
- Thiokol Chemical Corp., Bristol, Pa. \$1,478,830. Operation of a government-owned facility and for loading, assembling and packing of ammunition and related components. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00200 (A).
- Day & Zimmerman, Inc., Philadelphia, Pa. \$1,038,867. Operation of a government-owned facility and for loading, assembling and packing of ammunition items and



DEPARTMENT OF THE ARMY

- 1—Motorola, Inc., Scottsdale, Ariz. \$2,238,000. AN/APS-94 radar surveillance sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0419.
- Litton Systems, Woodland Hills, Calif. \$2,056,325. Test equipment to support AN/ASN-86 inertial navigation sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0345.
- Continental Motors, Mobile, Ala. \$1,860,000. Remanufacture of engine assemblies, with containers, for replacement spares for M48 and M60 tanks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-1166.
- Computer Sciences, Silver Spring, Md. \$1,465,116. Internal procedures and automatic data processing programs with a training program. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0436.
- Miller & Sons, Omaha, Neb. \$1,178,205. Work on the Pappillion Creek and Tributaries Project. Engineer Dist., Omaha, Neb. DA CW45-68-C-0155.
- Gisholt Machine Co., Madison, Wis. \$1,327,160. Five engine lathes. Army Procurement Agency, Chicago, Ill. DA AG11-68-C-1509.
- Mason & Hanger, Silas Mason Co., Lexington, Ky. \$4,633,823. Operation of a

- components, Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00114 (A).
- Mason & Hanger, Silas Mason Co., New York, N.Y. \$8,630,989. Operation of a government-owned facility and for loading, assembling and packing ordinance items and components, and for support services at the Army Ammunition Plant, Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00085 (A).
- Eastman Kodak Co., Kingsport, Tenn. \$2,964,926. Support services and operation of a government-owned facility for production of various explosives Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00095 (A).
- Firestone Tire & Rubber Co., Akron, Ohio. \$1,332,445. Modernization activities of a facility for loading, assembling and packing of ammunition and related components. Ravenna, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00065 (A).
- Federal Cartridge Corp., Minneapolis, Minn. \$3,745,300. Operation of a government-owned ammunition producing facility. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 36-038-AMC-01099 (A).
- Sperry Rand Corp., New York, N.Y. \$5,740,365. Operation of a government-owned ammunition producing facility. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00080 (A).
- Atlas Chemical Industries, Wilmington, Del. \$5,910,930. Operation of government-owned TNT producing facility. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00631 (A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$3,771,335. Operation of a government-owned propellant producing facility and for support services Bannock, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00106 (A).
- 9—Raytheon Co., Bedford, Mass. \$16,260,783. Advanced development of the SAM-2 missile. Army Missile Command, Huntsville, Ala. DA AH01-67-C-1995.
- Chrysler Corp., Warren, Mich. \$1,263,919. M60 tank range finders. Dayton, Ohio. Army Procurement Agency, Cincinnati, Ohio. DA AG31-69-C-0002.
- 10—S&M Contractors Co., Baltimore, Md. \$1,190,000. Construction of a ballistics instrumentation laboratory. Aberdeen, Md. Engineer Dist., Baltimore, Md. DA CA31-69-C-0004.
- 11—Zenith Radio Corp., Chicago, Ill. \$1,000,128. 2.75-inch rocket fuze metal parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0338.
- 12—Eby Construction Co., Wichita, Kan. \$5,235,098. Construction of a power plant and appurtenant works at the DeGray Reservoir, Ark. Engineer Dist., Vicksburg, Miss. DA CW33-69-C-0011.
- Timmons, Butt & Head, Inc., Dayton, Ohio. \$3,419,705. Construction of clean rooms in the Avionics Science Laboratory, Wright Patterson AFB, Ohio. Engineer Dist., Louisville, Ky. DA CA27-68-C-0057.
- M. M. Sundt Construction Co., Tucson, Ariz. \$1,528,000. Construction of an addition to the Technical Management Control Center, Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA09-69-C-0006.
- Construction, Ltd., Bordentown, N.J. \$1,156,780. Construction of a BOQ at Fort Belvoir, Va. Engineer Dist., Norfolk, Va. DA CA65-69-C-0001.
- 15—Collins Radio Co., Richardson, Tex. \$1,101,866. Engineering and technical services to provide advisory and liaison services to military users of Collins-manufactured communication equipment, world-wide. Electronics Command, Fort Monmouth, N.J. DA AB07-68-D-5000.
- 16—Hughes Tool Co., Culver City, Calif. \$1,091,161. Horizontal stabilizers and miscellaneous spare parts for OH-6A helicopters (Cynuse). Aviation Materiel Command, St. Louis, Mo. DA 23-204-AMC-03697.
- Lockheed Missile & Space Co., Sunnyvale, Calif. \$2,000,000. QT-3 Delta II aircraft. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1920.
- 17—Davis Contracting Co., Sandy Hook, Ky. \$2,969,747. Construction of a dam and spillway at East Lynn Lake, W. Va. Engineer Dist., Huntington, W. Va. DA CW69-69-C-0009.
- Penner Construction Co., Denver, Colo. \$1,621,777. Development of a new training area. Fort Riley, Kan. Engineer Dist., Kansas City, Mo. DA CA41-69-C-0010.
- Phileo Ford Corp., Newport Beach, Calif. \$35,770,360. Procurement of Shillelagh missiles. Hawthorne, Calif. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0059.
- 18—Page Communication Engineers, Washington, D.C. \$6,302,313. Twelve-months of operation and maintenance services for the Integrated Wide Band Communication System (IWCS) in Southeast Asia. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0416.
- Phileo-Ford Corp., Philadelphia, Pa. \$7,831,930. Twelve months operation and maintenance for the Integrated Wide Band Communication System (IWCS) in Southeast Asia. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0414.
- Lockheed Aircraft, Burbank, Calif. \$3,181,900. Various amounts of spare parts for AH-56A Cheyenne helicopters. Van Nuys, Calif. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1749.
- Bell Helicopter, Fort Worth, Tex. \$1,101,132. Cylinder assemblies and flight controls for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- AVCO Corp., Stratford, Conn. \$1,826,680. Rotor blades for UH-1 helicopters. Aviation Materiel Command, St. Louis, Mo. AF 41-608-67-A-8234.
- 19—Viz Mfg. Co., Philadelphia, Pa. \$1,026,285. Radio transmitter equipment. Electronics Command, Philadelphia, Pa. DA AB06-67-C-3104.
- 22—Raytheon Co., Bedford, Mass. \$38,202,222. Advanced development of the SAM-2D missile system. Army Missile Command, Huntsville, Ala. DA AH01-67-C-1995.
- Conductron Corp., St. Charles, Mo. \$4,000,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- Capitol Radio Engineering Institute, Washington, D.C. \$2,000,000. Classified electronic equipment. Silver Spring, Md. Electronics Command, Fort Monmouth, N.J.
- Northrop Corp., Asheville, N.C. \$1,104,314. XM183 and XM184 flares. Aberdeen Proving Ground, Md. DA AD05-68-C-0360.
- 23—Columbus Milpar & Mfg. Co., Columbus, Ohio. \$3,720,000. Metal parts for 81mm cartridge fuzes. Columbus and Westerville, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0800.
- ACF Industries, St. Louis, Mo. \$3,696,000. Metal parts for 81mm cartridge fuzes. Oliveville, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0291.
- General Time Corp., Stamford, Conn. \$1,823,137. Metal parts for M657 fuze boosters. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0054.
- REDM Corp., Wayne, N.J. \$1,005,000. Metal parts for 81mm cartridge fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0306.
- Wilkinson Mfg. Co., Fort Calhoun, Neb. \$1,097,250. Metal parts for 81mm cartridge fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0308.
- Caterpillar Tractor Co., Peoria, Ill. \$6,633,042. Tractors. Mobility Equipment Command, St. Louis, Mo. DA AK01-67-C-1364.
- Bell Aerospace Corp., Fort Worth, Tex. \$44,750,378. Rotary wing blades for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- Bulova, Inc., New York, N.Y. \$1,599,322. Production engineering of XM577 fuzes. Plantlany Arsenal, Dover, N.J. DA AA21-69-C-0020.
- AVCO Corp., Stratford, Conn. \$1,261,920. Turbine nozzles for UH-1 helicopter engines. Aviation Materiel Command, St. Louis, Mo. AF41608-67-A-3234.
- 24—Bell Aerospace Corp., Fort Worth, Tex. \$1,340,444. Main blade assemblies for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- 25—Flannigan Shipping Corp., New Orleans, La. \$10,108,346. Stevedore and related terminal services. New Orleans and St. Rose, La. Military Traffic Management and Terminal Service, Brooklyn, N.Y. DA HC21-69-D-0066.
- Lindetugel & Sons, Mitchell, S.D. \$1,497,907. Construction on the Red Rock Dam and Lake Red Rock Project, Des Moines River, Iowa. Engineer Dist., Rock Island, Ill. DA CW26-69-C-0007.
- Kinemax Corp., Alexandria, Va. \$1,329,172. Construction of a reinforced concrete bridge super structure at the Washington Aqueduct, Washington, D.C. Engineer Dist., Baltimore, Md. DA CW81-69-C-0002.
- Olin Mathieson Chemical Corp., East Alton, Ill. \$1,325,551. 16mm projectiles. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0320.
- Yost Construction Co., Decatur, Ind. \$1,000,433. Construction of access facilities at the Huntington, Ind. Reservoir. Engineer Dist., Louisville, Ky. DA CW27-69-C-0006.
- 26—General Electric, Burlington, Vt. \$9,785,650. 20mm sub-systems for AH-1G helicopters and related supplies. Army Weapons Command, Rock Island, Ill. DA AF03-69-C-0004.
- Benrus Watch Co., Ridgefield, Conn. \$1,177,348. Wrist watches. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0011.
- 29—Bulova Watch Co., Jackson Heights, N.Y. \$3,662,400. Metal parts for 81mm cartridge fuzes. Valley Stream, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0283.
- I.D. Precision Components Corp., Jamaica, N.Y. \$1,762,992. Metal parts for 81mm cartridge fuzes. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA00-68-C-0471.
- Z. D. Products, El Segundo, Calif. \$1,065,000. Metal parts for M48 fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0356.
- Raytheon Co., Andover, Mass. \$1,451,850. Repair and overhaul of RF oscillators for the Hawk missile system. Army Missile Command, Huntsville, Ala. DA AH01-68-A-0037.
- 30—Northern Metal Co., Philadelphia, Pa. \$3,756,114. Stevedoring, terminal handling, vehicle processing and services at Port Philadelphia, Pa. Military Traffic Management and Terminal Service, Brooklyn, N.Y. DA HC21-69-D-0065.
- ITT Industrial Laboratories, Fort Wayne, Ind. \$4,800,000. Night vision goggles. Ronoke, Va. and San Fernando, Calif. Mobility Equipment Research & Development Center, Fort Belvoir, Va. DA AK02-69-C-0000.
- General Electric, Burlington, Vt. \$3,590,000. 20mm guns and gun pods. Army Procurement Agency, New York, N.Y. DA AG25-68-C-1212.
- Action Mfg. Corp., Philadelphia, Pa. \$1,716,130. Metal fuze parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0472.
- Hayes Albion Corp., Albion, Mich. \$1,469,610. Metal parts for 81mm projectiles. Hillsdale, Mich. and Richmond, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0336.
- ARF Products, Raton, N.M. \$1,031,238. AN/GRC-50 radio sets with ancillary items. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0088.
- 31—LTV Electrosystems, Huntington, Ind. \$24,388,344. Vehicular radio set components. \$5,980,000. AN/PRC-25 radio sets. Electronic Command, Philadelphia, Pa. DA AB05-67-C-0171. DA AB05-68-C-0005.
- ITT Corp., Nutley, N.J. \$8,636,350. AN/GRC-144 radio sets. Clifton, N.J. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0027.
- General Motors, Kokomo, Ind. \$3,220,836. AN/PRT-4/PRR-9 squad radio sets. Electronics Command, Philadelphia, Pa. DA AB05-67-C-0161.
- Electrospac Corp., Glen Cove, N.Y. \$1,836,374. AN/PRC-77 radio sets and RT-841 receiver-transmitters. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0034.

- Chamberlain Mfg. Corp., Elmhurst, Ill. \$3,033,100 Metal parts for 106mm projectiles Waterloo, Iowa Ammunition Procurement & Supply Agency, Joliet, Ill DA A409-68-C-0062.
- Vare, Inc., Garland, Tex \$1,773,300. AN/FVS-8 searchlights, Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0291.
- J. J. Fritch Co., Dallas, Tex. \$1,375,400 Construction of four buildings for bachelor officers at Altus AFB, Okla. Engineer Dist., Albuquerque, NM DA CA47-69-C-0003.



DEPARTMENT OF THE NAVY

- American Mfg. Co., Fort Worth, Tex. \$12,040,000. MK 26, MOD 2, projectiles for 8-inch and 56-caliber guns. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5480.
- Chesapeake Instrument Corp., Shadyside Md. \$3,756,365. Manufacture of sonar equipment and associated material. Naval Ship Systems Command. N00024-68-C-1832.
- Sperry Rand, Great Neck, N.Y. \$3,584,000. Electronic equipment for sonar sets. Syosset, N.Y. Naval Ship Systems Command N00024-68-C-1829.
- General Dynamics, Pomona, Calif. \$3,200,000. Alterations to Terrier and Tartar missiles. Naval Ordnance Systems Command. N00017-68-C-2108.
- Raytheon Co., Bedford, Mass. \$2,420,000. Design and development of AN/SPG-53C radar. Naval Ordnance Systems Command. N00017-68-C-4206.
- Tyco Laboratories, Fairfield, N.J. \$1,115,240 MK 30, MOD 3, fuses for 5-inch, 38-caliber and 54-caliber gun ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5484.
- Seward Seacraft, Derwick, La. \$1,179,500. Construction of four 85-foot aluminum patrol craft. Naval Ship Systems Command. N00024-68-C-0302.
- Vitro Corp. of America, Silver Spring, Md \$1,081,200. Increased engineering, support services and facilities for Terrier, Tartar, Talos, Standard and Point Defense systems. Naval Ordnance Systems Command N00017-68-C-4401.
- Laupheimer Construction Co., Corpus Christi, Tex. \$1,949,600. Construction of a BOQ at the Naval Air Station, Corpus Christi, Tex. Naval Facilities Engineering Command. NBY-65184.
- Greenhut Construction Co., Pensacola, Fla. \$1,729,777. Rehabilitation of barracks and mess hall at the Naval Air Station, Pensacola, Fla. Naval Facilities Engineering Command. NBY-71108.
- Stanfield Construction Corp. and S. L. Hacha, Inc., San Diego, Calif. \$1,593,594. Construction of a mess hall at the Marine Corps Recruit Depot, San Diego, Calif. Naval Facilities Engineering Command. N62473-67-C-0025.
- Jordan Co., Suisun City, Calif. \$1,220,000. Construction of barracks at the Naval Training Center, San Diego, Calif. Naval Facilities Engineering Command. N62473-67-C-3064.
- Viola, Inc., Oxnard, Calif. \$1,273,000. Rehabilitation of barracks at the Construction Battalion Center, Port Hueneme, Calif. Naval Facilities Engineering Command. N62473-67-C-3117.
- McDonnell Douglas Corp., St. Louis, Mo. \$45,622,000. Additional funding for F-4E aircraft. Naval Air Systems Command. N00019-67-C-0495.
- Lockheed Aircraft, Sunnyvale, Calif. \$35,157,671. Tactical engineering services in support of the Fleet Ballistic Missile weapon system. Special Projects Office. N00080-69-C-0036.
- General Dynamics, Rochester, N.Y. \$10,767,211. Manufacture of radio sets and URR radios. Naval Electronic Systems Command. N00039-68-C-1555.
- North American Rockwell Corp., Columbus, Ohio. \$8,920,000. OV-10A helicopters \$8,800,000. T-2B aircraft. \$6,255,365 Shipboard Integrated Operational Intelligence Center (IOIC) including associated equipment, maintenance and material management. Naval Air Systems Command. NOW 66-0118 N00019-68-C-0346. N00019-68-C-0552.
- Northrop Corp., Newbury Park, Calif. \$8,331,250. MQM-74A target drones. Naval Air Systems Command N00019-68-C-0462.
- General Dynamics, Pomona, Calif. \$5,900,000. Standard Air missiles. Naval Air Systems Command N00019-67-C-0074.
- Gariett Corp., Phoenix, Ariz. \$4,500,000. Product support program for T76-G-10/12 engines. Naval Air Systems Command N00019-68-C-0354.
- United Aircraft, East Hartford, Conn \$1,386,890 General design, development and qualification testing of TF30-P-7 engines with pre-production ejector assembly kits. Naval Air Systems Command N00019-68-C-0440.
- Raytheon Co., Lowell, Mass \$1,109,638. Guidance and control groups for Chaparral guided missiles. Naval Air Systems Command N00019-68-C-0323.
- Control Data Corp., Bethesda, Md. \$4,040,327 Engineering and support services for FBM training installations. Special Projects Office. N00020-69-C-0011.
- Adams Russell Co., Waltham, Mass. \$1,807,000 Antonan system test sets. Naval Electronic Systems Command. N00039-68-C-2540.
- Electromagnetic Technology Corp., Lansdale, Pa. \$1,333,467. Manufacture of transistorized electronic counters. Coleman, Pa. Naval Electronic Systems Command N00039-68-C-2581.
- Gulf Stream Industries, Channelview, Tex. \$1,379,700 Sixty-three 26-foot personnel boats. Naval Ship Systems Command. N00024-68-C-0364.
- Peterson Builders, Inc., Sturgeon Bay, Wis. \$1,270,504 Construction of two 100-foot torpedo retriever boats. Naval Ship Systems Command. N00024-68-C-0375.
- Lockheed Aircraft, Sunnyvale, Calif. \$1,032,632. Design of an advanced guidance system for anti-radiation missile. Navy Purchasing Office, Los Angeles, Calif. N00123-68-C-1487.
- General Dynamics, Rochester, N.Y. \$9,126,672 Design, development and installation of an AUTEQ sonar performance range. Naval Ship Systems Command. N00024-68-C-1007.
- LTV Aerospace Corp., Dallas, Tex \$5,184,478. A-7E aircraft. Naval Air Systems Command. N00019-68-C-0075.
- Packard Bell Corp., Newbury Park, Calif. \$3,223,914. Manufacture of AN/UPM-137 radar sets. Naval Electronic Systems Command. N00039-68-C-2585.
- General Precision Systems, Glendale, Calif. \$1,000,000. MK 48 torpedo fire control system modification kits MK 101. Naval Ordnance Systems Command. N00017-68-C-1218.
- Raytheon Co., Portsmouth, R. I. \$1,052,450 Five sets of preproduction units of submarine sonar equipment. Naval Ship Systems Command. N00024-68-C-1341.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$34,249,068. A-6A aircraft. Naval Air Systems Command. N00019-68-C-0166.
- Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$11,325,000. Evaluation of the functional feasibility of a multi-sensor detection and attack system in a research and development flight test vehicle. Naval Air Systems Command. N00019-68-C-0055.
- United Aircraft, Stratford, Conn. \$20,880,000. HH-53C helicopters. Naval Air Systems Command. N00019-68-C-0427.
- United Aircraft, Hartford, Conn \$1,350,004 Test, analysis and evaluation of modified TF30-P-3 engines. Naval Air Systems Command. N00019-68-C-0480.
- McDonnell Douglas Corp., Long Beach, Calif., has been awarded the following four contracts by the Naval Air Systems Command: \$1,460,656. A-4H aircraft. N00019-67-C-0009.
- \$14,196,400. A-4F aircraft. N00019-67-C-0170.
- \$2,168,784. TA-4F aircraft. N00019-67-C-0170.
- \$1,066,925. Radome assemblies and pods. N00019-68-C-0626.
- Lockheed Aircraft, Burbank, Calif. \$14,465,992 P-30 aircraft. Naval Air Systems Command. N00019-68-C-0073.
- Sanders Associates, Nashua, N. H. \$10,020,560. Electronic equipment. \$3,864,960 Electronic equipment. Naval Air Systems Command N00019-68-C-0630 and NO v(A) 66-0356.
- Hazeltine Corp., Little Neck, N.Y. \$11,321,214. Airborne interrogator sets and related support items \$1,756,800 Detection transmitting sets, acoustic Naval Air Systems Command. N00019-68-C-0644. N00019-68-C-0609.
- Teledyne Systems, Northridge, Calif. \$12,420,000 FY 68 procurement of AN/ASQ-104 self-contained navigation systems and spares for CH-16D helicopters. Naval Air Systems Command. N00019-68-C-0623.
- Raytheon Co., Santa Barbara, Calif. \$3,898,193. Transmitters, control unit frequency dividers, remote control units, gate generators and ancillary items for EA-6A aircraft. Naval Air Systems Command. N00019-68-C-0624.
- North American Aviation, Los Angeles, Calif. \$2,421,628. YF-39E aircraft. Naval Air Systems Command. N00019-68-C-0025.
- LTV Aerospace Corp., Dallas, Tex \$1,756,483. Development of new stores capability and envelope expansion for A-7A/D aircraft. Naval Air Systems Command. N00019-68-C-0298.
- Sanders Associates, Plainville, N.Y. \$1,176,027. Radio directional finders, antennae, and engineering installation services. Naval Ship Systems Command N00024-68-C-1819.
- Johns Hopkins University, Silver Spring, Md \$1,506,000. Research and development on Project Bumblebee. Naval Ordnance Systems Command. NOW 62-0904-C.
- Vitro Corp., Silver Spring, Md. \$1,082,876. Increased engineering and support services and facilities for Terrier, Tartar, Talos, Standard and Point Defense Systems. Naval Ordnance Systems Command. N00017-68-C-4401C.
- General Electric, Washington, D.C. \$7,977,180 Work on Phase II Poselton guidance. Pittsfield, Mass. Special Projects Office. N00020-66-C-0184.
- Raytheon Co., Sudbury, Mass. \$13,880,824. Poselton guidance systems services and materials. Special Projects Office. N00030-66-C-0159 P0006.
- M.I.T., Cambridge, Mass. \$4,361,800. Poselton guidance systems development. Special Projects Office. N00030-66-C-0189.
- Sperry Rand Corp., Long Island, N.Y. \$5,050,000. Work on MK 68 gun fire control system computers. \$1,340,603. Work on Terrier/Tartar guided missile system computers. Naval Ordnance Systems Command. N00017-68-C-2303 & N00017-67-C-2113.
- Westinghouse Electric, Baltimore, Md. \$1,216,000. Training for the support of the technical and operational evaluation program on the MK 48, MOD 0, torpedo weapon system. Keyport, Wash. Naval Ordnance Systems Command.
- Lockheed Missile & Space Co., Sunnyvale, Calif. \$4,824,000. Repair of Polaris hardware. Special Projects Office. N00030-69-C-0064.
- Aerojet General, Nimbus, Calif. \$1,989,122. MK 52, MOD 1, rocket motors. Naval Ordnance Station, Indian Head Md. N00174-69-C-0004.
- Wesley of Florida, Inc., Jacksonville, Fla. \$1,394,000. Construction of barracks at the Naval Air Station, Cecil Field, Fla. Southeast Div., Naval Facilities Engineering Command, Charleston, S. C. NBY-84098.
- General Electric, Washington, D.C. \$10,290,000. Poselton fire control and support equipment. Pittsfield, Mass. Special Projects Office. N00030-66-C-0166 Mod. F012.
- Sperry Rand Corp., Great Neck, N.Y. \$5,218,000. Terrier MK 76, MODS 3&5, fire control system modernization. Naval Ordnance Systems Command. N00017-67-C-0046.
- Sperry Rand Corp., Great Neck, N.Y. \$5,000,000. Inertial navigation subsystem equipment and supporting items for seven Fleet Ballistic Missile Submarines within the Poselton submarine conversion program. Syosset, N.Y. Naval Ship Systems Command. N00024-68-C-5100.

- General Instrument Corp., Chicopee, Mass. \$2,571,899. Bomb fuzes for the Snakeye 500-lb bomb. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5187.
- Lockheed Missile & Space Co., Sunnyvale, Calif. \$1,460,679. Missile test readiness equipment. Special Projects Office, N00030-67-C-0051.
- Harbor Boatbuilding Co., Terminal Island, Calif. \$1,264,388. Regular overhaul of the minesweepers USS Gulde (MSO-447) and USS Gallant (MSO-489). Supervisor of Shipbuilding, Conversion and Repair, Eleventh Naval Dist., Long Beach Calif.
- 11-United Aircraft, East Hartford, Conn. \$1,280,529. \$1,268,637. J52 engines on A-4E and A-6A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-9-68-000A-AF421. N00383-9-69-000A-AF420.
- Sperry Rand Corp., Syosset, N.Y. \$1,250,000. Technical services in support of navigational systems on board Navy oceanographic and research vessels. Naval Purchasing Office, Brooklyn, N.Y. N00140-68-D-0488.
- 12-Sperry Rand Corp., Syosset, N.Y. \$1,095,080. Field engineering and technical assistance for the 1969 FY Polaris submarine program. Naval Ship Systems Command, N00069-C-5019.
- General Electric, Schenectady, N.Y. \$5,950,000. Nuclear propulsion components. Naval Ship Systems Command.
- Coamodyne Corp., Torrance, Calif. \$1,336,924. Missile cradles for MK 12 and MK 14, MOD O, missiles. Naval Air Engineering Center, Philadelphia, Pa. N00156-69-C-0504.
- 15-Kilgore Corp., Toone, Tenn. \$11,500,500. MK 46, MOD O, aircraft parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5498.
- Curtiss Wright Corp., Wood-Ridge, N.J. \$3,961,859. Spare parts in support of J65W18A engines used on A-4B/C aircraft. Aviation Supply Office, Philadelphia, Pa. F41608-07-A-5900-GBGW.
- Lifton Systems, Silver Spring, Md. \$1,982,423. Electronic countermeasure equipment. Naval Air Systems Command, N00019-69-C-0041.
- Carrier Corp., Alexandria, Va. \$1,920,937. 150-ton centrifugal air conditioning units. Naval Ship Systems Command, N00024-69-C-5090.
- 17-Sperry Rand Corp., Syosset, N.Y. \$3,476,819. Repair and modification of U.S. and U.K. Fleet Ballistic Navigation Subsystem components. Naval Ship Systems Command, N00024-69-C-5015.
- General Dynamics, Groton, Conn. \$1,221,412. Preparation and submission of various type advanced submarine strategic missile systems. Naval Ship Systems Command, N00024-68-C-0345.
- 18-Lockheed Aircraft, Marietta, Ga. \$7,696,180. Materials and services to perform progressive aircraft rework on C-130 aircraft, including overhaul of components. Naval Air Systems Command, N00019-67-C-0231.
- United Aircraft, Stratford, Conn. \$3,440,150. Airframe parts for CH-53A helicopters. Aviation Supply Office, Philadelphia, Pa. N00883-69-A-3900-0017.
- G. L. Cory, Inc., San Diego, Calif. \$2,709,781. Construction of an electronics maintenance school at the Naval Training Center, San Diego, Calif. Naval Facilities Engineering Command, N62473-67-C-3150.
- Sperry Rand Corp., Great Neck, N.Y. \$2,205,000. Production of Signal Data Converters. Naval Ordnance Systems Command.
- Lifton Systems, Woodland Hills, Calif. \$1,045,869. Spares in support of inertial navigation systems. Naval Air Systems Command, N00019-67-C-0623.
- 19-Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$143,500,000. Design and construction of two guided-missile, nuclear-powered frigates. Naval Ship Systems Command, N00024-68-C-0828.
- United Aircraft, Hartford, Conn. \$4,370,368. Development test of the TF30-P-12 engine. Trenton, N.J. Naval Air Systems Command, N00019-68-C-0538.
- Grumman Aircraft Engineering Corp., Segundo, Calif. \$1,000,000. Contract definition phase of the VFX weapon system. Naval Air Systems Command, N00019-69-C-0047.
- LTV Aerospace Corp., Dallas, Tex. \$1,000,000. Contract definition phase of the VFX weapon system. Naval Air Systems Command, N00019-69-C-0052.
- General Dynamics, San Diego, Calif. \$1,000,000. Contract definition phase of the VFX weapon system. Naval Air Systems Command, N00019-69-C-0047.
- North American Rockwell Corp., El Segundo, Calif. \$1,000,000. Contract definition phase of the VFX weapon system. Naval Air Systems Command, N00019-69-C-0048.
- McDonnell Douglas Corp., St. Louis, Mo. \$1,000,000. Contract definition phase of the VFX weapon system. Naval Air Systems Command, N00019-69-C-0051.
- 22-Boeing Co., Morton, Pa. \$2,579,473. After rotor blades for CH/UH-46 helicopters. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-5601-0289.
- L. H. Lacy Co., Dallas, Tex. \$1,245,250. Construction of an aircraft parking apron at the Naval Auxiliary Air Station, Chase Field, Tex. Gulf Div., Naval Facilities Engineering Command, New Orleans, La. NBY-80451.
- 23-Alco, Inc., St. Louis, Mo. \$13,919,088. Rocket launchers. Naval Air Systems Command, N00019-68-C-0562.
- E. E. Black, Ltd., Honolulu, Hawaii. \$4,027,509. Construction of sewage collection and treatment facilities at the Public Works Center, Pearl Harbor, Hawaii. Pacific Div., Naval Facilities Engineering Command, Honolulu, Hawaii. NBY-82366.
- Alco, Inc., St. Louis, Mo. \$1,854,620. Rocket launchers. Naval Air Systems Command, N00019-67-C-0621.
- I. T. & T., Easton, Pa. \$1,790,980. QKW-1132 travelling wave electron tubes used in classified equipment. Electronics Supply Office, Great Lakes, Ill. N00126-68-C-0148.
- Northwest Construction Co., San Francisco, Calif. \$1,432,906. Construction of a damage control school at the Treasure Island Naval Station, San Francisco, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBY-85445.
- Ravitchon Co., Waltham, Mass. \$1,149,000. QKW1132 travelling wave electron tubes used in classified equipment. Electronics Supply Office, Great Lakes, Ill. N00126-68-C-6181.
- Dillingham Corporation of Nevada, Honolulu, Hawaii. \$1,092,000. Construction of shoreline protection of the Johnston Atoll. Pacific Div., Naval Facilities Engineering Command, Honolulu, Hawaii. NBY-92542.
- 24-Hughes Aircraft, Culver City, Calif. \$15,600,000. Phoenix missiles. Naval Air Systems Command, N00019-68-C-0379.
- Allen & O'Hara, Inc., Memphis, Tenn. \$1,373,240. Construction of an exchange retail store and cafeteria at Naval Air Station, Memphis, Tenn. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. NBY-81501.
- General Dynamics, Groton, Conn. \$154,000,000. Construction of nuclear-powered submarines. Naval Ship Systems Command.
- 25-Sellen Construction Co., Seattle, Wash. \$5,341,700. Construction of an engineering building at the Naval Shipyard, Bremerton, Wash. Northwest Div., Naval Facilities Engineering Command, Seattle, Wash. NBY-84987.
- Lockheed Aircraft, Burbank, Calif. \$4,000,000. Change in the configuration of P-3B aircraft to YP-3C and for associated materials and services. Naval Air Systems Command, N00019-68-C-0043.
- American Mfg. Co., Fort Worth, Tex. \$2,382,360. MK 52, MOD O, projectiles for use in 5-inch, 88 cal. gun ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-C-0083.
- Schroeder Construction, Inc., Fall River, Mass. \$1,372,000. Construction of a technical training building extension at the Naval Destroyer School, Newport, R.I. Northeast Div., Naval Facilities Engineering Command, Boston, Mass. N62464-67-C-0287.
- 26-Vitro Corp., Silver Spring, Md. \$16,748,865. Fleet ballistic missile program system engineering. \$2,580,925. A receiving buoy subsystem. Special Projects Office, N00030-69-C-0030. N00030-68-C-0218.
- 29-United Aircraft, Stratford, Conn. \$1,701,050. CH-53A airframe parts. Aviation Supply Office, Philadelphia, Pa. N00383-69-A-3900-0032.
- Honeywell, Inc., Hopkins, Minn. \$1,571,908. Work on MK 46 torpedoes and related equipment. Naval Ordnance Systems Command, N00017-68-C-1306.
- Reid & Hope, Suffolk, Va. \$1,100,182. Construction of an electronics training building addition at the Naval School Command, Norfolk, Va. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. NBY-85502.
- 30-Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$6,110,000. EA-6A aircraft. Naval Air Systems Command, N00019-68-C-0209.
- General Dynamics, Pomona, Calif. \$3,385,510. Standard Arm missiles. Naval Air Systems Command, N00019-67-C-0899.
- Sylvania Electric Products, Waltham, Mass. \$1,259,987. AN/PRC-30 radio sets. Naval Air Systems Command, N00019-68-C-0592.
- Bunker Ramo Corp., Silver Spring, Md. \$1,193,400. Work on ECM equipment. Naval Air Systems Command, N00019-68-C-0210.
- Sperry Rand Corp., Charlottesville, Va. \$1,289,557. Degaussing equipment. Naval Ship Systems Command, N00024-69-C-5040.
- 31-General Electric, Schenectady, N.Y. \$21,899,500. Research and development in nuclear propulsion. Naval Ship Systems Command, N00024-67-C-5016.
- Aerojet-General Corp., Sacramento, Calif. \$13,948,455. Production of MK 66 mines. Naval Ordnance Systems Command, N00017-68-C-1201.
- American Mfg. Co., Fort Worth, Tex. \$12,155,572. MK 82, MOD 1, bomb bodies for 500-lb. bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0745 MOD P014.
- Lockheed Missiles & Space Co., Sunnyvale, Calif. \$3,488,715. Re-entry systems effectiveness studies. Special Projects Office, N00030-69-C-0060.
- Atlantic Research Corp., Alexandria, Va. \$2,598,440. Classified work. Naval Ordnance Systems Command.
- United Aircraft, East Hartford, Conn. \$1,046,117. TF30P-3 engine spare parts for F-111A aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-9-69-000A-AF518.



DEPARTMENT OF THE AIR FORCE

- 1-Modulux, Inc., Newark, Calif. \$2,647,610. Production of relocatable buildings. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga. 09606-68-C-2820.
- Pan American World Airways, New York, N.Y. \$102,097,000. Operation of the Eastern Test Range. Eastern Test Range, Patrick AFB, Fla. F08606-68-C-0040.
- Lockheed Aircraft, Ontario, Calif. \$7,000,000. FY 69 maintenance services for the Advanced Pilot Training Program. Luke AFB, Ariz. Sacramento Air Materiel Area, (AFSC), McClellan AFB, Calif. F04606-69-C-0001.
- Loral Corp., Bronx, N.Y. \$2,638,877. Work on AN/ALR-31 electronic countermeasure system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F38657-68-C-0531.
- J. B. M. Corp., Gaithersburg, Md. \$3,327,660. Work on a large aperture seismic array experimental signal processing system. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628-67-C-0198.
- RCA, Moorestown, N.J. \$5,225,540. Depot level maintenance and supply support for instrumentation radars. Air Force Eastern Test Range, (AFSC), Patrick AFB, Fla. F08606-68-C-0041.

- 3—North American Rockwell Corp., Anaheim, Calif. \$4,479,088. FY 1969 engineering services in support of the Minuteman missile system. Oklahoma City Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69-C-0012.
- RCA, Camden, N.J. \$13,999,122. Operation, maintenance and logistic support of White Alice Communications System for FY 1969. Anchorage, Alaska Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F4606-68-C-0740.
- Thiokol Chemical Corp., Brigham City, Utah. \$1,000,000. Production of illuminating flares. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-68-C-1387.
- Ryan Aeronautical Co., San Diego, Calif. \$10,319,000. Production of MQM34A and D target drones and related items of equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-68-C-0001-P005.
- Northrop Corp., Hawthorne, Calif. \$1,700,000. F-5 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1036.
- Emerson Electric Co., St. Louis, Mo. \$4,565,000. General purpose automatic test system in support of various types of aircraft. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-C-8901.
- 5—General Electric, Syracuse, NY \$8,304,330. Operation, maintenance and logistic support of spacetrack sensor sites for FY 1969. Shemya AFS, Alaska Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-1-0348.
- General Electric, Cincinnati, Ohio. \$18,201,600. Production of J-79-17 engines for F-4 aircraft. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0074-P003.
- General Electric, Cincinnati, Ohio. \$11,884,000. J79-GE-10 engine special support equipment, kits and related data. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0682.
- RCA, Camden, N.J. \$25,697,500. Materials, operational services and maintenance of the Ballistic Missile Early Warning System microwave communications facilities at Clear Air Force Station, Alaska, and other overseas sites. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-C-0789.
- General Dynamics, Fort Worth, Tex. \$1,440,243. Operation and maintenance of the radar target scatter site at the White Sands Missile Range, N.M. Air Force Missile Development Center, Holloman AFB, N.M. F26000-68-C-0036.
- ITV Electronics, Salt Lake City, Utah. \$3,905,000. Production of navigational aids. Garland, Tex. Rome Air Development Center, Griffiss AFB, N.Y. F30002-68-C-0382.
- Marwald Steel Co. and Pascoe Steel Corp., Richmond, Calif. \$5,288,042. Steel arch aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33601-68-C-1135.
- Young Metal Products, East Chicago, Ind. \$2,404,495. Steel arch aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33601-68-C-1135.
- Sylvania Electric Products, Needham Heights, Mass. \$3,462,498. Support of a ground electronics system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04694-67-C-0050-P000.
- Universal Airlines, Ypsilanti, Mich. \$2,208,474. Domestic cargo airlift service in support of Air Force Logistics Command LOGAIR and Navy QUICKTRANS systems. Military Airlift Command. F11626-68-C-0038.
- Saturn Airways, Oakland, Calif. \$2,033,078. Domestic cargo airlift support of AFLC LOGAIR system. Military Airlift Command. F11626-68-C-0023-P021.
- 3—System Development Corp., Santa Monica, Calif. \$15,448,140. Computer program updating and preparation of a system training program. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-C-0777.
- RCA, Moorestown, N.J. \$1,877,897. Operation, maintenance and logistic support of the Moorestown Spacetrack facility for FY 1969. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-C-0910.
- General Electric, Philadelphia, Pa. \$33,900,000. Production of the MK 12 re-entry system. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. F04701-68-C-0178.
- Boeing Co., Seattle, Wash. \$6,548,726. Design, development, study and test programs for the Minuteman Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. AF04-694-946.
- North American Aviation, Los Angeles, Calif. \$5,857,786. Kits for the wing center section structure assembly of the F-100 aircraft and modification kits for the outer wing panel of the F-100 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-67-A-1313-0260.
- 11—Hayes International Corp., Birmingham, Ala. \$9,691,754. Services and materials for inspection and repair, and modification of KC-135 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-3607.
- North American Rockwell Corp., Anaheim, Calif. \$1,500,000. Overhaul and repair of all ground missile parts and components. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-4486.
- 12—General Electric, West Lynn, Mass. \$5,273,011. T85-GE-17A engines in support of A-37B aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33656-67-C-1459-P01.
- 15—Boeing Co., Seattle, Wash. \$1,700,000. Modernization of the Minuteman force at Whiteman AFB, Mo. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0296.
- Boeing Co., Seattle, Wash. \$3,000,000. Checkout and test of Minuteman III and associated elements. Vandenberg AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04694-67-C-0101.
- 16—TRW, Inc., Redondo Beach, Calif. \$5,783,400. Development support of the Minuteman weapon system program. Norton AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04694-67-C-0127-P004.
- McDonnell Douglas Corp., Tulsa, Okla. \$2,650,000. Modification and maintenance of B-52 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-0009.
- Westinghouse Electric, Baltimore, Md. \$25,706,401. Modification of B-57B aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1050.
- 17—Lockheed Aircraft Service Co., Jamaica, N.Y. \$2,123,750. Inspection, repair and maintenance of C-121 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-C-0005.
- ITV Electronics, Inc., Greenville, N.C. \$4,336,310. Inspection and repair as necessary of F-101 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F42600-69-D-0026.
- 18—Cessna Aircraft, Wichita, Kan. \$3,987,500. Production of A-37B aircraft, spare kits, aerospace ground equipment and data. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1290.
- 19—Philco-Ford Corp., Palo Alto, Calif. \$7,805,000. Development, fabrication and launch of two communication spacecraft. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0149.
- 22—Fairchild Hiller Corp., St. Augustine, Fla. \$4,161,773. Inspection and repair, as necessary, of F/TF-102A aircraft. Crestview, Fla. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41603-69-C-0411.
- 23—American Electric, Inc., La Mirada, Calif. \$1,781,253. Production of airborne munitions. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1193-P002.
- 25—Boeing Co., Wichita, Kan. \$2,064,650. Aerospace ground equipment and technical order kits for B-52 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-1002.
- FMC Corp., Santa Clara, Calif. \$1,371,103. Airborne munitions. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1199-P002.
- General Dynamics, San Diego, Calif. \$1,051,797. Launch support services at Vandenberg AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0140.
- 29—Federal Electric Corp., Paramus, N.J. \$23,380,570. Operation and maintenance of

Air Force Western Test Range technical facilities. Vandenberg AFB, Calif. Air Force Western Test Range. F01697-67-C-0001.

—Edgerton, Germeshausen & Grier, Albuquerque, N.M. \$2,500,000. Development and installation of the advanced research electromagnetic simulation facility. Air Force Special Weapons Center, Kirtland AFB, N.M. F29601-69-C-0004.

—ITT Technical Services, Inc., Paramus, N.J. \$1,245,000. Maintenance and operation of AF Plant 42, Palmdale, Calif. Air Force Flight Test Center, Edwards AFB, Calif. F04611-68-C-0001.

30—Lockheed Aircraft Corp., Sunnyvale, Calif. \$2,000,000. Reentry vehicle technology and observables program. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0157.

OFF SHORE PROCUREMENT

5—Norwegian Defense Research Establishment, Kjeller, Norway. \$3,995,200. Installation of a larger aperture seismic array research facility in Norway. European Office, Air Force Aerospace Research Command.

11—Canadian Marconi Co., Montreal, Quebec, Canada. \$1,112,016. AN/APN-176(V)-3 navigation sets for HH-53C aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Electronics High Dollar Procurements Forecast

The Defense Electronics Supply Center has issued its 16th annual Forecast of High Dollar Procurements under the Very Important Program (VIP). The most recent list does not include the Hi-Valu list that was part of last year's forecast.

The current VIP list shows items expected to be bought during at least one quarter of the next 12 month period. Items which were on last year's list, but which will not be procured during FY 1969, have been deleted from VIP List No. 16.

In his letter transmitting the list, Colonel W. L. Sims, USMC, Director of Procurement and Production, warned that the forecast was subject to revisions, that it was in no way binding, and that it should not be interpreted to mean that any solicitation has been made for items listed. Actual procurement of items will be initiated with individual Invitations for Bid and/or Requests for Proposal, which will be announced in the *Commerce Business Daily*.

Colonel Sims' letter noted that small business and/or labor surplus area set-aside contracts probably would be made for some of the forecast items.

Comments and requests for the 18-page forecast list should be sent to Defense Electronics Supply Center (DESC-PPA), Dayton, Ohio 45401. Inquiries about specific items listed should be sent to the center, with attention directed to DESC-FL.

OFFICIAL BUSINESS

When requesting address change, include current mailing label, above.

New Air Force Human Resources Lab To Focus on Training, Management

A new Air Force laboratory organization has been established to be the focal point for research and development in human resources education, training and management.

Called the Air Force Human Resources Laboratory (AFHRL), it is a subordinate command of Air Force Systems Command (AFSC), and is headquartered at Brooks AFB, Tex.

AFHRL is charged with planning and executing research and exploratory-advanced development programs in personnel selection, management and career development; personnel motivation and retention; personnel force structures and composition, training techniques and equipment; personnel requirements for advanced weapon systems; and career education.

The new laboratory will also provide technical and management assistance in support of studies, analyses, development planning activities, acquisition, test evaluation, modification or operation of aerospace systems, and related equipment.

The laboratory's two major divisions are the Personnel Research Division, located at Lackland AFB, Tex., near the Brooks AFB headquarters, and the Training Research Division, located at Wright-Patterson AFB, Ohio. The Personnel Research Division was formerly a laboratory under the Aerospace Medical Division (AMD) of AFSC, and the Training Research Division was part of AMD's Behavioral Sciences Laboratory.

Among the first projects of the new laboratory will be establishment of training research detachments at one or more of Air Training Command's pilot training schools and technical training centers. There are plans to substantially expand training research and development activities.

Initial manpower allocations put 23 persons at the headquarters, 219 people at the Personnel Research Division and 39 individuals at the Training Research Division. AFHRL is one of nine laboratories under the supervision of Brigadier General Raymond A. Gilbert, Director of Laboratories for the Air Force Systems Command.

Seminars Scheduled by DSA on New Logistic Data System

Two identical seminars have been scheduled by the Defense Supply Agency to acquaint government contractors and other industry representatives with the Federal Item Identification Guide (FIIG) program, an improved logistics data system now being established.

The two one-day seminars will be held October 22 and 23 in the Defense Supply Agency auditorium at Cameron Station, Alexandria, Va. No admission charge will be made but advance registration is required.

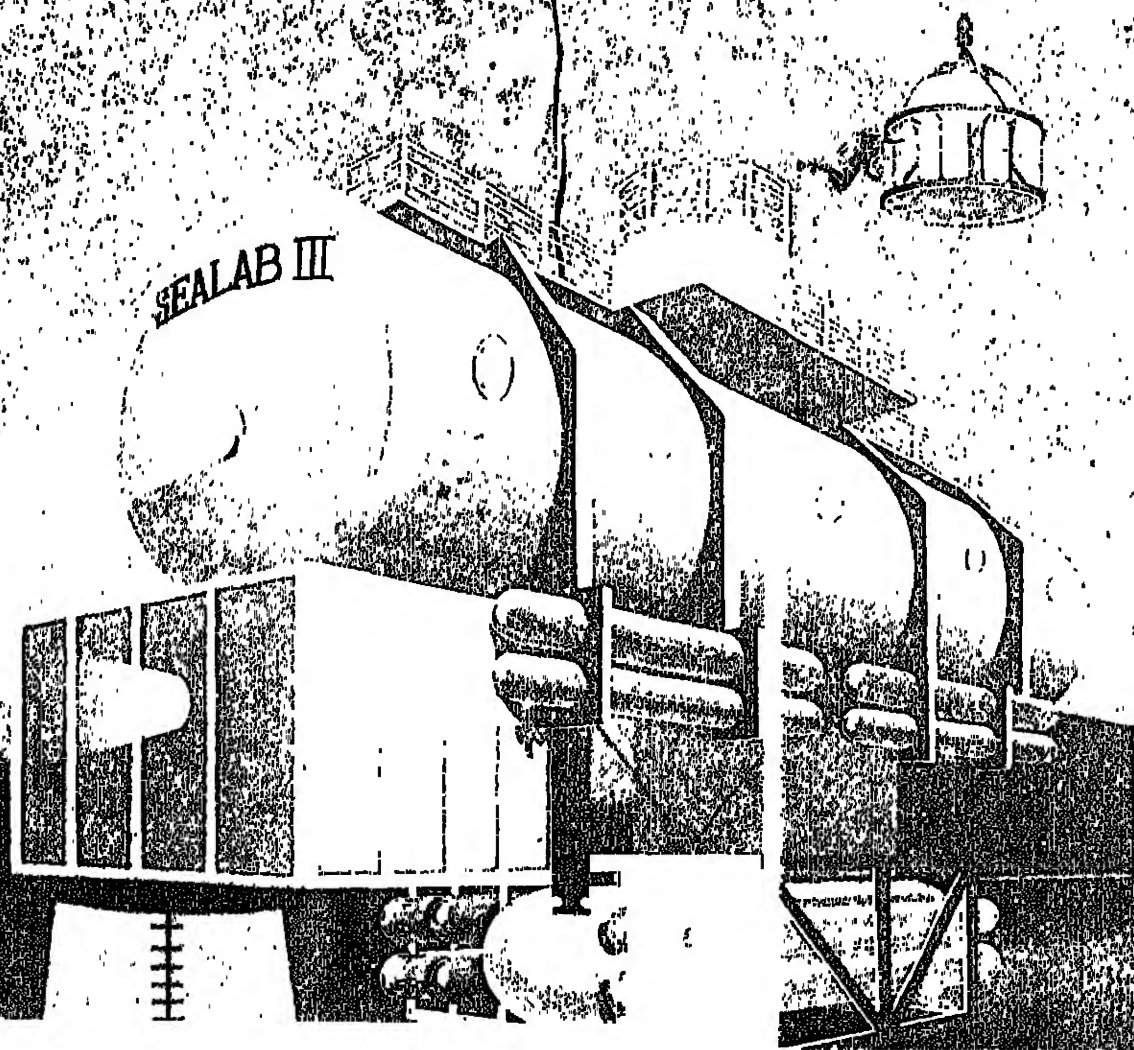
The FIIG program was designed to provide a computer-oriented replacement for Description Patterns and other documents in the Federal Catalog System. It now covers more than 30 commodity areas ranging from bolts to compressors. Eventually all supplies purchased and stocked by the U. S. Government will be covered by the guides.

Registration forms and a descriptive brochure may be obtained from S. S. Horwitz, (DSAH-SCC), Defense Supply Agency, Cameron Station, Alexandria, Va. 22314.



INDUSTRY BULLETIN

October 1968



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The *Defense Industry Bulletin* is published monthly by the Publications Branch, Projects Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

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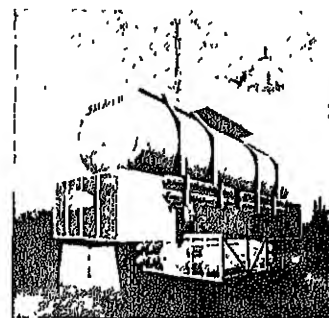
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About the Cover



Artist's concept shows SEALAB III habitat and transfer capsule. Experiment in sea-bottom living begins the middle of October.

More Defense Contractors Augment Income Through Value Engineering Proposals

R. E. Biedenbender

R. H. Kempter

Back in the cost-plus-fixed-fee days, when a defense contractor submitted a cost reduction change requiring government approval, he frequently found his fee cut as a result. Needless to say, under this type of incentive, DOD received few proposals of this kind.

This negative incentive was replaced by a positive incentive with the adoption of value engineering contract incentive clauses, now provided for in the Armed Services Procurement Regulation (ASPR), Section I, Part 17. These clauses invite contractors to submit sound Value Engineering Change Proposals which require a contract change, and to benefit from such action by sharing the resulting savings with the Government.

Current value engineering incentive clauses permit contractors to receive up to 75 percent of the net savings on a current contract, 20 to 40 percent of savings on follow-on contracts (even though another contractor gets the bid), and 10 percent of the collateral savings (savings in government operating expenses) for an average year.

Value engineering contract incentive provisions provide a new avenue for the defense industry to augment income, and this avenue does not require significant investments in capital equipment or labor. DOD also benefits, since its share of Value Engineering Change Proposal (VECP) savings could not otherwise be generated. Thus the DOD Value Engineering Contract Incentive Program offers unique joint benefits to Government and industry.

How well are these incentives working? Let us look at the record. Since emphasis was placed on value engineering contract incentives in FY 1965:

- DOD's estimated share of savings exceeds \$150 million.

- Over 3,400 contractor-initiated VECPs have been approved.

- Contractors average 43 cents income for each dollar saved by DOD.

More specifically, let us examine the progress from FY 1967 to FY 1968:

- Estimated savings to DOD in FY 1968 reached \$51.8 million, an increase of 33 percent over the previous year.

- The number of VECPs approved in FY 1968 reached 985, an increase of 28 percent over FY 1967.

- The FY 1968 VECP acceptance rate reached 60 percent, up 5 percent over FY 1967.

- Only 39 percent of the VECPs on hand at the end of FY 1968 were still in process after 60 days, compared to 65 percent at the end of FY 1967.

Thus dollar savings and number of approvals are growing, while government processing time has decreased significantly.

Another view of this progress can be obtained by examining patterns of increasing contractor participation. The number of contractors participating with High-Value VECP approvals (a VECP with estimated net savings exceeding \$50,000) increased from 55 in FY 1967 to 64 in FY 1968. Several contractors, successful in FY 1967, increased their efforts substantially in FY 1968. One had 11 High-Dollar approvals with an estimated income of \$1.95 million in FY 1967, and 19 High-Dollar approvals with an estimated annual income of \$4.7 million in FY 1968. Another had 12 High-Dollar approvals in FY 1967, and 15 in FY 1968 with total estimated income of \$3.8 million.

A Specific Example

Let us look in detail at a motivated contractor's VECP record. The following statistics, covering the period from July 1967 to May 1968, show the results obtained by Honeywell Ordnance Division, where significant management emphasis has been placed on the generation of VECPs:

Submissions:	116
Approvals:	57
Pending:	39
Submission Rate:	5 per month
Approval Rate:	
Quantity-wise:	69 percent
Dollar-wise:	70 percent
Average Processing Time:	
Submission to Approval:	92 days
Approval to Cost Modification:	207 days
Dollar Value (in millions):	
Total Instant Contract Savings:	\$3.877
Royalties Received:	\$0.415
Royalties Claimed and Due:	\$0.722
Pending VECPs:	\$2.270

This record is of even greater interest when it is realized that Honeywell has sold VECPs to all three Services, with virtually the same acceptance rate, on a variety of items including mechanical and electronic fuzing, torpedoes, and rocket air drop munition systems. The Honeywell experience indicates that an enterprising contractor can augment income significantly by generating a high volume of sound VECPs.

Room for Growth

While the current progress is encouraging, there is still a vast untapped potential for benefits to DOD and industry through VECPs. An extensive review of the DOD Value Engineering Contract Incentive Program indicates there is an immediate

potential for savings of \$200 million annually through VECPS.

There is still wide variation in understanding and support given the Value Engineering Program by defense industry top management. An analysis of DOD VECP Reports for FY 1968 shows that 10 participating contractors generated estimated savings to DOD from High-Dollar VECPS in the amount of \$29.4 million. These successful contractors will share as estimated \$15 million in additional income. On the other hand, another group of 10 major defense contractors, who received a total of \$2,584 billion in contract awards, produced no savings. It is difficult to believe that no High-Dollar VECP opportunities existed in the volume of business received by the latter group of contractors.

Where To Look

After the management decision to commit resources to the VECP opportunity has been made, sound VECPS must be generated. Figure 1 is taken from a 1965 Genesis Study and illustrates the areas of opportunity which permitted generation of VECPS. It indicates that VECPS can be successfully developed over the entire spectrum of design and manufacture. Other contractors have produced excellent results in the follow-on support phase. In the case of Honeywell cited previously, emphasis has been placed on submission of sound, well developed and documented VECPS. The company frequently rejects "marginal" VECPS in-house. This policy has paid off with an acceptance rate of 70 percent compared to the 60-percent DOD average. Figure 2 indicates some common causes for rejection of VECPS and pitfalls to be avoided in submitting viable VECPS to DOD activities.

Action Needed To Increase Benefits

A 1968 Logistics Management Institute (LMI) study of contractor value engineering programs made four recommendations for expanding benefits to DOD and industry through VECPS:

- That DOD continue its educational, training and promotional efforts in the DOD VECP Program for all concerned personnel at all levels of DOD and the defense industry.

- That DOD improve VECP processing time.

- That DOD closely monitor experience with the ASPR provisions relating to value engineering.

- That defense industry intensify its educational, training and promotional efforts in the DOD VECP Program.

These recommendations were essentially substantiated by several independent government studies. Resulting DOD actions include the second DOD Value Engineering In-House Conference held in September 1967. Approximately 400 DOD middle managers spent three days exchanging views on policies and progress of the Value Engineering Program. Virtually all the key logistic officials in the Office of the Secretary of Defense, the Military Departments and the Defense Supply Agency participated. A special three-day executive seminar was established and has been

held for key DOD managers in 12 different locations during the course of this year. These courses are designed to meet the need for understanding and support of middle management involved in contracting, logistic support, engineering, etc.

Actions have also been taken within DOD to expedite VECP processing. These actions include the establishment of an improvement goal for each Service on the percentage of VECPS held over 60 days. Progress is being measured quarterly. Significant improvement was achieved in FY 1968, as cited earlier in this article. The DOD Value Engineering Council holds monthly reviews of the five oldest VECPS on hand in each Service. New configuration control directives, setting target dates for VECP processing and handling according to priorities, have been issued.

With regard to defense contrac-

Factors Leading to Value Engineering Changes DOD Contractors

(116 Class I Changes)

Factor	No. Times Cited	* Total \$ Saving	Factor
Excessive Cost	75	\$ 5,736	Excessive Cost
Questioning Specification	53	5,453	Questioning Specification
Additional Design Effort	42	4,038	Advances in Technology
Advances in Technology	33	1,646	Additional Design Effort
Feedback from Test/Use	21	860	Change in User's Need
Change in User's Need	16	832	Feedback from Test/Use
Design Deficiencies	11	421	Design Deficiencies
Totals	251	\$19,886	

* \$—Thousands

Figure 1

tors, additional actions are underway. The heads of all major defense corporations are advised annually of progress of the program during the past year. The Defense Contract Administration Services Office, in conjunction with the Society of American Value Engineers, has been holding a series of value engineering executive seminars nationwide to acquaint industry with the VECF opportunity. Also, key officials of the Office of the Secretary of Defense are visiting selected contractors to discuss value engineering contract incentives informally with contractor top management. The Military Departments have activities of a similar nature.

The Honeywell Formula

The LMI study, previously mentioned, indicated that industry must also educate its personnel on the

VECF opportunity. While DOD is assisting this effort through media such as the DCAS-SAVE value engineering seminars and visits to contractors, ultimately industry must recognize the VECF opportunity and organize to capitalize upon it.

The Honeywell Ordinance Division formula for successful VECF results has 10 key points:

- **Know Your Market.** Recognize the opportunity provided by ASPR 1-17 (Revision No. 23) and its impact on your own sales objectives.

- **Plan Your Program.** Draw up and schedule a value engineering plan of attack. Put value engineering on an equal business footing with your other key projects.

- **Execute Your Plan.** Make a commitment of manpower and funds at the top management level in accordance with corporate profit objectives.

- **Establish Your Own Professional Value Engineering Staff.** Use it as a catalyst to generate sound results through training and consultation.

- **Motivate Your Planners and Doors.** Educate personnel at all levels in the cost reduction potential of value engineering and the means of applying value analysis techniques to in-plant projects.

- **Involve Your Line Management.** Let project supervision participate in establishing cost reduction goals. Hold them responsible for measuring results and reporting progress.

- **Work Your Teams.** Use your trained manpower to form value engineering task teams and systematically eliminate unnecessary costs, project by project.

- **Tailor Your Results.** Write VECFs which help your customer attain his cost goals while maintaining or improving upon schedule, quality and performance.

- **Market Your Product.** Put the emphasis on selling, installing and servicing a VECF that its profit value deserves.

- **Realize Your Benefits.** Everybody wins when government-industry teamwork culminates in the adoption of an incentive VECF: the customer and the taxpayer through reduced costs; corporate management and the stockholder through incentive sharing of the dollars saved.

LMI Suggestions

The validity of the Honeywell formula is particularly interesting in the light of these LMI findings in its 1968 study:

- **Top industry management** does not always fully understand the intent and objectives of the DOD VECF Program and, consequently, sometimes fails to give it full support. Aggressive, successful contractor VECF programs were usually found where top management does fully understand the program's objectives.

- **Where contractors focus their attention on the "savings sharing" potential to themselves from the DOD VECF Program and relate these shares to augmentation of their income and to return on their value engineering investment rather than to "cost reduction" to DOD, top management support was usually not a problem.** For example, one large contractor, which

DOD CONTRACTOR VECFs—FY 1967

Reasons Given for Rejection of 134* VECFs Order of Frequency

Order of Frequency	Reason for Rejection	No. of Citations	Percent Citations
1	Item or System Performance Adversely Affected	48	35.8
2	Not a VECF	26	19.4
3	Technical Supporting Information Incomplete or Inaccurate	23	17.2
4	Proposal Initiated or Developed by the Government	10	7.5
5	No Reason Given	7	5.2
6	Cost Analysis Incomplete or Inaccurate	5	3.7
7	Qualification Test Required	4	3.0
8	Contract Fulfilled Before Proposal Evaluated	4	3.0
	Other	7	5.2
		134	100.0

* Estimated total net savings before sharing; each VECF at least \$50,000.

Data Source: DOD VECF Report—FY 1967

Figure 2

had received over \$1 million in savings shares from its accepted VECPs, noted: "The \$1 million plus profit enhancement is equivalent to \$20 million in new business."

- Some contractors appear to put too low a level of investment into their overall value engineering effort. For example, a National Aerospace Services Association survey showed that the level of value engineering investment ranged from 3/100 to 1/10 of 1 percent of annual sales in five member companies (a 1963 report indicated that 1/10 to 1/2 of 1 percent of total annual sales appeared to be a reasonable level of investment for value engineering).

- Some contract administration and comptroller personnel in defense industry do not fully understand the intent and objectives of the DOD VEC Program and, consequently, fail to pursue it aggressively and fail to give proper visibility to industry benefits realized from the program.

- Top defense industry management support of the DOD VEC Program would probably increase if contractors would relate their "savings shares" to augmentation of their income and to return on their value engineering investment, rather than to "cost reduction" to DOD.

In the specific area of industry VEC preparation and processing through DOD, LMI recommended that greater industry emphasis be placed upon such matters as:

- Reduction of length of VEC processing time within industry itself.

- Improvement of the quality of industry VECs, with more complete supporting technical information and cost analysis.

- Establishment of early and continuing VEC communications channels with DOD counterparts.

This last point deserves emphasis. Historically, industry VEC communication has been mainly to DOD working levels. There is now growing recognition in industry that the VEC income potential warrants top level communication between key contractor and government personnel on specific contracts and programs to insure mutual understanding of the benefits of VECs, to discuss expected volume of VEC submissions, and to agree on any local ground rules necessary for their processing. Such a step is particularly useful at this time, since the relatively recent development of current ASPR provisions relating to value engineering means that many people in both industry and Government are only now becoming acquainted with the benefits and use of this new technique.

Check Yourself

As growing understanding of the techniques and benefits of value engineering contract incentives causes more and more defense contractors to take advantage of this new opportunity to increase income, interest is growing in the basic ingredients for a successful VEC program. The American Ordnance Association is currently planning a survey of successful contractors to specifically identify management practices which seem to enhance chances for success, and will hold a symposium in October on this subject. This activity should be of great benefit to industry and Government.

Meanwhile, contractors may wish to check their programs against the following checklist, compiled by DOD personnel as a result of many informal discussions with successful contractors:

- () Do you set company or division goals for VEC income?

- () Are VEC goals established for line department and program managers?

- () Does top management review VEC income and approve value engineering operating goals and budgets?

- () Does company top management meet with key customer personnel to agree on VEC goals and processing on major contracts and programs?

- () Do personnel, such as marketing, work on the "team," and do they receive credit for VECs approved, or are they "penalized" due to reduced credit for reduced contract price?

- () Do your negotiators understand the ASPR provisions relating to value engineering? Do you request and negotiate for fair terms?

- () Do you place provisions for value engineering in your subcontracts?

- () Is VEC income identified separately by accounting so that Renegotiation Board review is eased and top management can recognize the contribution of value engineering?

- () Do you assign resources to the development of specific VECs?

- () Does your method of operation allow minimum time to develop a VEC and to obtain internal company approval prior to submission to the Government?

(Continued on page 16)



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Aquanauts To Explore Ocean Bottom

[Editor's Note: This article was prepared by the Bulletin staff based on fact sheets on the SEALAB III project released by the U. S. Navy Deep Submergency Systems Project, 6900 Wisconsin Ave, Chevy Chase, Md. 20015.]

What is the world like on the ocean floor, 600 feet below the surface of the sea?

To answer that question, 40 U.S. and foreign Navy and civilian aquanauts will live in a sea-bottom habitat off the shores of San Clemente Island, Calif., beginning this month. They will work in the open ocean area around their undersea quarters, and will conduct scientific experiments.

The objective of the Ocean Floor Program experiment, dubbed SEALAB III, is to gain knowledge and know-how pertinent to the adaptation of man to the deep sea environment at ambient pressure. The primary interest of the Defense Department and the Navy in the Man-in-the-Sea experiments is to provide a capability for rescue and salvage operations, maintenance of bottom-mounted equipment, use of the continental shelf for military operations associated with, for example, mine defense and amphibious assault. However, this program has vast secondary peaceful gains for the nation. Technology gained in Man-in-the-Sea will hasten and make possible exploitation of the world's continental shelves for food, minerals and recreation. The economic and scientific potential of the sea is as great or perhaps greater than that of land surfaces.

By 1970, the U.S. Navy plans to have diver-aquanauts living in advanced sea habitations on the continental shelves for 30 days or more without coming to the surface. The depth capability of the aquanauts will ultimately be extended from the average 600-foot depths of the shelves down to the as yet unknown, physiological limits of man.

Five teams of eight men each,

including civilian scientists, will occupy the underwater habitat alternately for 12-day periods during the 60-day experiment. The divers will engage in activities ranging from assembly of a house on the ocean floor to studies of how light attracts fish.

Fifty-four men—Americans, British, Canadian and Australian—have been undergoing training for several months to take part in the experiment. Forty aquanauts will work on the bottom; the remaining 14 will serve as surface support divers and will provide a ready reserve of trained and qualified divers.

Commander M. Scott Carpenter, the former astronaut who was team leader for 30 days during the 1965 SEALAB II operation, will serve as senior aquanaut of SEALAB III. He will direct the activities of the five team leaders and will make periodic visits to the teams during their stay on the sea floor.

The Ocean Floor Program consists of tasks in six general areas:

- Oceanography.
- Engineering.
- Construction.
- Salvage.
- Biology.
- Human performance.

A number of U.S. Navy activities, the Department of Interior's Bureau of Commercial Fisheries, and the Philadelphia General Hospital are involved in developing these tasks.

The Oceanography Task

Within the oceanography areas, experiments will be conducted in physical and biological oceanography, the use of marine mammals, geology and bio-acoustics.

In the physical oceanography task, devices will be installed on the ocean floor, including current meters, thermographs, a tide gauge, an underwater "weather station," temperature recorder, a bio-luminescence meter, a radiance meter, a ripple measuring

comb, and a salinity meter. The underwater weather station, which is in addition to other measuring devices, will record temperature and current data at three levels above the bottom at least once a minute. A falling-ball turbulence study, developed by internationally known French oceanographer, Captain Jacques Cousteau, will investigate turbulence and eddies in the ocean by plotting the impact location of negatively buoyant balls released from a given height above the ocean floor.

Oceanographic measurements will also be made from the surface and in the water column.

Aquanauts from the Bureau of Commercial Fisheries will conduct work in the areas of marine biology and ecology. They will create a cadre of personnel trained in saturation diving techniques and familiar with engineering design, support, and operations on the sea floor. Their work will also provide a preliminary assessment of the research value of observation and experimentation in the deep-ocean environment. Further development of the undersea laboratory concept as a research technique for oceanographic and fisheries work is expected to yield large benefits to marine resource development.

In their task, the diver-scientists will undertake a variety of short-term experiments, including lobster transplant studies, light attraction studies of fish and invertebrates, and observations of fish species behavior and interaction. They will also study light production by biological organisms.

Aquanauts will study marine mammal behavioral and physical capabilities to help develop training techniques. During SEALAB II in 1965, an Atlantic bottlenose porpoise named Tuffy was used to demonstrate the feasibility of employing a marine mammal to aid a lost aquanaut, and to deliver tools, messages and other objects. Two wild sealions also be-

friendly the crew of SEALAB II; they could be called by the aquanauts and fed by hand, and they surfaced in the well of the habitat to breathe the helium-oxygen atmosphere before returning to the surface.

Tuffy returns to the Man-in-the-Sea program in SEALAB III, along with another porpoise and two sealions. They will be used to search for and, if necessary, rescue lost aquanauts, as well as for delivery of small items, propulsion aid, and to assist in underwater photography. Small items, such as tools and specimen containers, will be attached to a mammal's harness for delivery between the habitat and surface, habitat and divers, or between two or more divers working in open water. During the tests, an aquanaut will also use an acoustic device to signal he is "lost." The mammal is expected to respond by picking up a tethered line at the habitat and carrying it to the aquanaut.

The geological oceanography program will observe sedimentological processes, such as transport, scour and structural settlement, which heretofore have been unattainable by conventional divers. Current measurements and time-lapse photography will be used to support the sediment transport studies.

During SEALAB III, efforts will be made to identify sounds produced by marine organisms. This work will involve placing hydrophones on the bottom 50 and 100 feet from the habitat, and recording under "quiet" conditions as well as normal sub-surface operating conditions.

Engineering Data Collection

Work in the engineering phase involves communications, evaluation of exposure suits and face masks, and extensive engineering evaluation of the sea floor habitat and systems.

The effectiveness of various types of voice communications (such as between aquanauts in the water and in the habitat) in SEALAB III type operations, where man breathes speech-distorting helium, will be studied.

Exposure suits, with the aquanauts heated by circulating warm water or electric "blanket" suits, will be tested in an effort to extend diver working time in the open sea. Similarly, tests of special face masks and helmets will be conducted.

Data will be collected to measure the effectiveness of various sea-floor habitat systems and life-support equipment. This data will provide parameters and criteria for future sea floor installation designs. Major areas being studied are structural, such as ports, hatches, access openings, drains and ballast; systems, such as the ballasting system, pressure control, plumbing and food storage; and habitability, such as space utilization, safety and comfort.

Construction on the Ocean Floor

The construction experiment in SEALAB III will help determine the ability of divers to assemble structures on the ocean floor. In this experiment four aquanauts will assemble and repair a storage station near the sea floor habitat.

The aquanauts will use an underwater trolley system, with a variable buoyancy pod containing a hydraulic winch, to move prefabricated sections of the structure along the ocean floor. The sections will be assembled with quick-connect/quick-release fasteners. A buoyant "chandelier" will be suspended over the structure to provide area lighting.

The complete station will be 10 feet high and have a 10-foot diameter with the bottom open to the sea to provide an entryway. A grillwork in part of the opening will serve as a floor. After the structure is assembled, it will be blown dry and outfitted with shelves, interior lights, and other accessories for use as a repair and storage station.

Emphasis on Underwater Salvage Techniques

A main purpose of the Man-in-the-Sea effort is to improve underwater salvage techniques.

A chemical bottom overlay spray will be tested in an effort to reduce bottom turbidity to enable more effective work by divers.

Four salvage lift systems will be tried:

- A small, rugged, self-contained lift system consisting of a 70-cubic-foot buoyancy pontoon and a hydrazine gas generator.
- An 8.4-ton lift collapsible pontoon inflated by surface supplied air.
- A Hunley/Wischoefer Lift System which consists of a 25-ton salvage padeye, a variable buoyancy messenger buoy, and a remote coupl-

ing device for attaching the lifting point being salvaged to the lifting wires of a surface ship.

- A small, self-contained variable buoyancy system including attachments for moving small objects, 100 to 200 pounds, along the bottom.

Four improved diver tools will be tested in SEALAB III: an explosive cable cutter, an explosive stud driver, an electric-powered hand tool, and oxy-arc burning equipment. The electric hand tool is a multi-purpose device which works on the impact principle. This will be especially useful where no firm surface is available to help the diver brace himself against the effects of conventional torque tools. Problems of providing oxygen through hoses for deep-depth use of oxy-arc burning tools also will be examined.

Improved methods of locating objects on the ocean floor will be tested, among them a "spider web" of light grid lines carried between aquanauts, and a new type of circling line. These tests will help divers locate objects within an area when working in the murky, deep-depth bottom environment.

Observation of Crew Performance

During previous saturation diving experiments, aquanauts have developed infections, and microorganisms have been transferred among personnel. Now scientists wish to determine the susceptibility or resistance to infection of man in the sea-floor environment.

The electrocardiogram telemetry task will study cardiac performance and body temperatures at different depths, water temperatures, and conditions of physical and mental stress. Cardiac performance will be monitored by telemetering and electrocardiogram while the divers are in the water and in the habitat.

The heated diver's dress and thermal balance phase of the biology program will investigate body heat loss due to the helium-oxygen atmosphere of the habitat, and the effectiveness of protective thermal equipment when the aquanaut is in the water.

Investigations will be conducted in sleeping habits of aquanauts exposed to prolonged living in the high-pressure, helium-oxygen, semi-isolated, and stress conditions of the SEALAB.

Experiments relating to speech and

manual dexterity will be directed toward determining whether there is a performance loss at various depths, with observations being made at the surface, 8 feet, 200 feet, 300 feet, 400 feet, 450 feet, and 600 feet. The performance being observed will include helium speech, fine and gross manual dexterity, and associative memory.

Human performance will be measured during execution of various work and salvage operations. The emphasis is on developing procedures and work doctrines, rather than testing equipment.

Similarly, construction tasks will measure diver performance during underwater use of hand tools, moving and manipulating heavy pieces of equipment, and extensive coordination among aquanauts and between aquanauts and surface support personnel.

Experiments will test underwater visibility of aquanauts on the open sea and in the habitat.

A crew observation experiment seeks to develop a better understanding of behavior of individuals and crews in special environments of saturation diving and the sea-floor habitat. Some of the questions to be answered are:

- How does man respond to this environment?
- What kind and how much work can he best perform?
- How will he get along with other divers?

• What will be his relationship to surface life?

• How will he react emotionally?

• How do his reactions compare with those of other men exploring unusual environments, such as outer space, the Antarctic, Mount Everest, and other remote areas.

• How should SEALAB crews be organized?

During SEALAB III the aquanauts will be observed by closed-circuit television, monitored by open microphone, and extensively interviewed in an effort to answer these and other questions.

In addition to the Ocean Floor Program described here, several related programs will be conducted in the fields of physiological testing, atmospheric control, aquanaut equipment, and human engineering evaluation.

SEALAB III Habitat

The habitat for SEALAB III, a modification of the habitat used during SEALAB II, is a non-propelled submersible, constructed and shaped much like a submarine. It is designed as a pressure vessel to be lowered and emplaced on the ocean floor. It has positive stability on the surface, and while submerging or surfacing. Water ballast tanks are used to control positive and negative buoyancy.

The living compartment of the habitat is cylindrical, 12 feet in diameter and 57 feet long. Two rooms, 8 feet high and 12 feet square are

attached to the bottom of the hull of the habitat, one forward and one aft of the craft. The after room will be used as a diving station. It houses diving lockers, diving gear, hot showers, and the open hatch for access to the sea. The forward room is planned for use as an observation and storage compartment. It is fitted with large portholes and a refrigerator-freezer unit. It also has an emergency escape hatch.

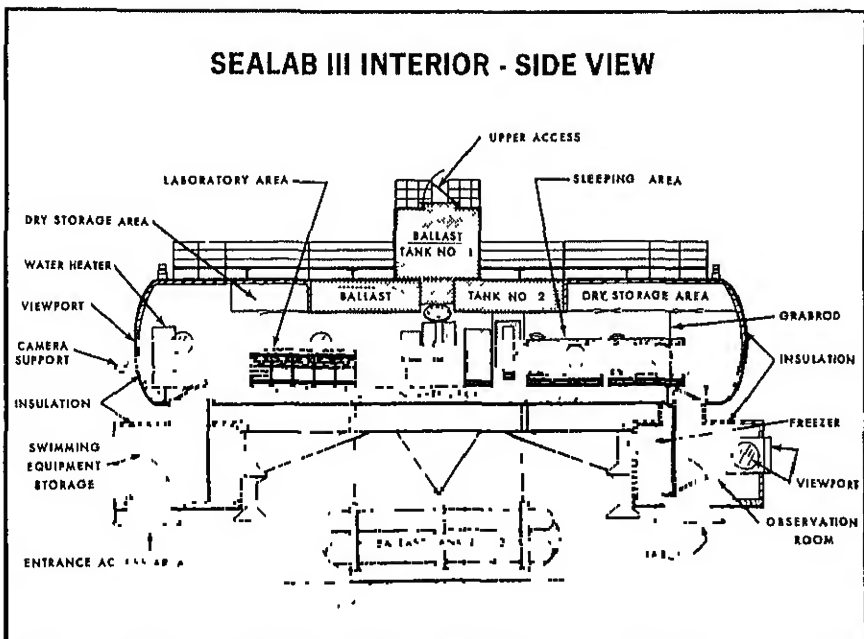
From the diving station compartment, the aquanaut climbs a ladder through a hatch to the main living compartment. The living compartment can be sealed off from the diving station to reduce humidity.

The living compartment is divided into a laboratory, galley and bunkroom, as one goes forward from the entryway. Eleven viewing ports are provided on the hull, each protected by a light outboard cover and a pressure inboard hinged cover.

Electric power, fresh water, communications, television links, and other life-support needs are supplied through an umbilical from a surface support vessel stationed almost directly above the underwater habitat. Emergency life-sustaining supplies are stored aboard the habitat.

The atmosphere in the living compartment will be kept at 206 pounds per square inch absolute, corresponding to 430 feet of water. It contains about 92 percent helium, 6 percent nitrogen, and 2 percent oxygen. Replenishment gas is brought in through the umbilical from the support ship, or from external bottles stowed on the habitat. The atmosphere in the living compartment is charged on the surface and during lowering to the sea floor. Sixteen external bottles will contain enough breathing gas to sustain eight men for 15 days. Carbon dioxide is removed from the atmosphere by a device known as a scrubber, which contains the chemical lithium-hydroxide. Charcoal is used to remove odors. Both chemicals must be replaced as they are used.

Electric dehumidifiers control the humidity, and heat is supplied by convection heaters. A radiant system with thermostats maintains habitat temperature at about 92 degrees. Although this degree of heat would be excessive at the surface, it is required in the habitat because body heat loss in the helium atmosphere is greater than in normal air.



Support Operations

The staging vessel to be used in support of the SEALAB III operation is a modified medium rocket landing ship (LSMR), named Elk River (IX 501). This class of ship was originally designed to support landing operations, but its modifications will enable the vessel to support all aspects of in-place testing at the San Clemente Island Ocean Engineering Test Range.

During the SEALAB III experiment, the ship will be held in a tight moor, vertically over the bottom location of the habitat. The ship will be tethered by five mooring lines, one from each quarter and one lead directly over the bow. A tensiometer connected to each leg will indicate the tension at all times.

The vessel is outfitted with two deck decompression chambers, each designed to support four divers during the six-hour decompression period needed to return saturated divers from the pressure found at 600 feet to normal atmospheric conditions.

A pressurized elevator system, called a Personnel Transfer Capsule, will transport divers from the ship to the bottom habitat. The capsule will mate with the deck decompression chambers so that at all times, whether topside or at the 600-foot operating level, the aquanauts can be kept at pressures equivalent to the ambient ocean pressures at the bottom.

The Elk River will also provide storage for the various compressed gases needed. Because of huge requirements for helium, a recovery unit aboard the vessel will be evaluated for installation on other Navy diving ships.

Two portable vans are installed topside, one a command center, the second a medical van. These will be the nerve centers of the SEALAB III operation. They will bring together in one location all the critical measurements affecting the safety and well being of the aquanauts. The ship was also lengthened 21 feet; a center well was installed; a 60-ton gantry crane services the well area and stern; eight-foot sponsons added to the sides of the ship provide needed space and stability; and, finally, an active positioning system will orient and hold the ship for operations of short duration not requiring an elaborate mooring system.

Man-in-the-Sea Began on Land

The Man-in-the-Sea program began in 1958 with Project Genesis, a six-year series of dry-chamber, high-pressure experiments which led to the development of a new diving concept in saturated diving. This concept has given the Navy the potential for extended underwater experiments. It was used by the American investigator Edwin A. Link and by Jacques Cousteau in their underwater living experiments.

The experiments proved that the length of time required for decompression was not invariably related to the length of the dive. For the first time, it was demonstrated that a diver will absorb only a specific amount of gas at any given depth, the amount reaching a maximum after 24 hours of exposure to pressure. Thus, after 24 hours in the ocean depths at pressure, the diver's tissue and blood have reached equilibrium with the breathing gas, and he is fully saturated. Once fully saturated, his decompression schedule remains constant regardless of how long he may stay beneath the surface. This awakened scientists to the possibility of men living underwater for extended periods of time.

The Navy successfully tested its laboratory results in open-ocean experiments SEALABs I and II. These projects conclusively demonstrated the possibilities of living underwater. SEALAB I was held during July

and August 1964 in 193-foot deep waters 30 miles southwest of Bermuda. Four aquanauts lived underwater for 11 days without significant physiological or psychological change. SEALAB II was held off the coast of La Jolla, Calif., in the summer of 1965 at a depth of 205 feet. In this experiment, three teams of 10 aquanauts lived on the ocean bottom for 15-day periods.

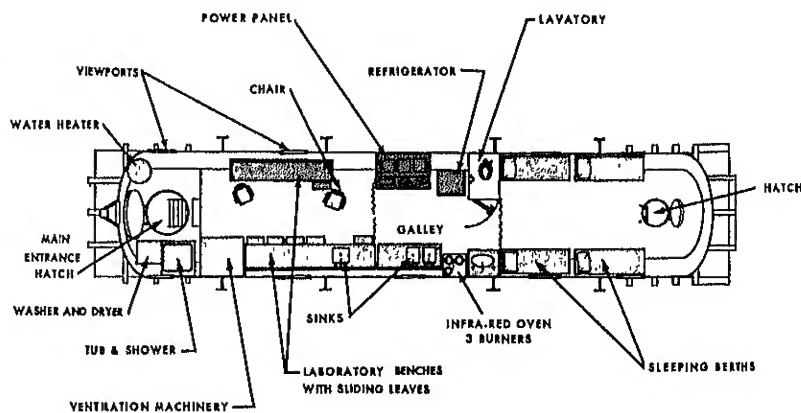
Intensive Training Precedes "Down Day"

For several months, the U.S. and foreign Navy and civilian SEALAB III aquanauts have intensively trained to improve their skills as divers and in a number of specialized fields. Their underwater work included projects in biology, ecology, bio-acoustics, physical oceanography, geology, bio-luminescence, construction, salvage, photography and communications.

Most of the Navy aquanauts entered SEALAB III training from diving assignments in the Fleet, assignments as ship's divers, underwater demolition teams, explosive ordnance disposal and salvage. Other trainees had previous Navy or civilian diving experience.

Personnel of the U.S. Navy in the program are all qualified first class divers, having attended the 26-week Deep Sea Diving course in Washington, D.C. This course qualified the divers in the use of Scuba gear for

SEALAB III INTERIOR - TOP VIEW



depths to 130 feet using compressed air, and in the use of "hard hat" diving to depths of 320 feet using a helium-oxygen breathing mixture. The navy divers from Britain, Canada and Australia had similar training.

Most of the aquanauts also underwent specialized training at the Naval Underwater Swimmers School, Key West, Fla., at the Navy Experimental Diving Unit in Washington,

and the Deep Submergence Systems Project Technical Office (DSSPTO) in San Diego, Calif.

At the Underwater Swimmers School, the divers attended a two-week course in the use of Scuba gear, breathing helium-oxygen to depths of 150 feet. During SEALAB III the aquanauts will work in the water around their habitat using a Mark VIII semi-closed Scuba, which provides helium-oxygen breathing gas

from back bottles or through a hose from the habitat. The semi-closed system purifies and recirculates about two-thirds of the breathing mixture and exhausts the remainder.

Training at Key West was designed primarily to acclimatize the aquanauts to work while using the semi-closed Scuba. Technical training in the use and maintenance of the Mark VIII equipment was taught at the Experimental Diving Unit and DSSPTO.

At the Experimental Diving Unit the men made dives in dry and wet chambers to simulate deep-ocean pressure. These "dives" determined if the aquanaut candidates were psychologically and physiologically suited for saturation diving. In these dives the men were taken to various simulated depths, eventually spending at least 24 hours at the 450- or 600-foot level. They were then slowly returned to surface pressure, undergoing a carefully calculated decompression to prevent their contracting the deadly "bends."

In addition to diver and equipment evaluation aspects of the chamber dives, each Navy aquanaut was taught to operate a saturation diving system similar to the one which will be used in SEALAB III. That system is, itself, a prototype of an advanced diving complex which will be used in the Fleet.

Certain SEALAB III aquanauts received special training to prepare them for specific tasks in the ocean bottom program. For example, aquanaut photographers will install and maintain a special camera and lights package at the SEALAB III test site. They practiced servicing and operating the equipment in the actual environment they will encounter in the open ocean. Hospital corpsmen learned to use special equipment for bio-medical analysis in the SEALAB III environment, and to monitor the seafloor habitat's atmosphere.

Prior to the start of SEALAB III experiment, the men will receive intensive training at the DSSPTO, "homeport" and primary training facility for U.S. Navy aquanauts. This will include daily open-sea diving exercises, instruction in the operation of SEALAB III equipment, including special tools, and additional practice in safety procedures. Each man will swim using the Mark VIII Scuba and the hot water, electrical or isotope heated wet suits

(Continued on page 10)

SEALAB III

A Summary of Tasks and Names of Participating Organizations

Oceanography

Physical	Navy Mine Defense Laboratory
Biology/Ecology	Bureau of Commerical Fisheries
Marine Mammal Use	Naval Missile Center
Geological	Naval Oceanographic Office
Bio-acoustics	Naval Undersea Warfare Center
Biology	Naval Oceanographic Office

Engineering

Communications; Exposure Suit and Face Mask; and Habitat Engineering	Navy Mine Defense Laboratory
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Construction

Structure	Naval Civil Engineering Laboratory
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Salvage

Bottom Stabilization; Lift Systems; Diver Tools; and Search Procedures	Supervisor of Salvage and Naval Civil Engineering Laboratory
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Biological

Bacteriology	Naval Medical Research Institute
Sleep Studies	Deep Submergence Systems Project
EKG Telemetry	Philadelphia General Hospital
Heated Diver's Dress and Thermal Balance	Naval Medical Research Institute

Human Performance

Speech and Manual Dexterity	Navy Experimental Diving Unit and Office of Naval Research
Salvage Tasks	Supervisor of Salvage and Office of Naval Research
Construction Tasks	Naval Civil Engineering Laboratory and Office of Naval Research
Visibility Tasks	Navy Mine Defense Laboratory and Office of Naval Research
Crew Observation	Naval Medical Research Institute and Office of Naval Research

Physiologic Test Program

Deep Submergence Systems Project

Atmospheric Control

Naval Research Laboratory

Aquanaut Equipment

Deep Submergence Systems Project

Human Engineering Evaluation

Deep Submergence Systems Project, Office of Naval Engineering, and Submarine Medical Center

Research and Development Objectives for Future Defense Communications System

Colonel John P. Walsh, USAF

Lieutenant Colonel Richard S. Barry, USMC

The Defense Communications System (DCS) is a long haul point-to-point system formed from the assets of the Army, Navy and Air Force. It is operated by the Services under the overall management of the Defense Communications Agency (DCA). The system does not include the tactical communications systems operated by military commanders.

A complex and physically large system, the DCS comprises more than 52,000 circuits, more than 196,000 two-way channels spanning 44 million two-way channel miles. It interconnects 77 different countries and U.S. possessions. A large portion of these facilities are leased from commercial common carriers (see article, "Defense Communications Interface with Commercial Carriers," *Defense Industry Bulletin*, May 1968, page 10). In FY 1968, leased services cost the DCS \$278 million. The investment in military-owned fixed plant is approximately \$2.5 billion. Annual operating costs of the whole system ran from about \$600 to \$700 million in FY 1968. To operate and maintain the system, the Military Services provide more than 40,000 people.

The system includes all types of transmission media, landlines, submarine cables, troposcatter, microwave, high frequency radio, and satellites. The major elements of the DCS include some 118 networks, such as the Strategic Air Command's Primary Alert System, the general purpose Automatic Voice Network (AUTOVON), the general purpose Automatic Digital Network (AUTODIN), the Secure Voice Network (AUTOSEVOCOM), the Defense Special Security Communications System (DSSCS), and certain leased or government-owned transmission media including military communications satellites. At the present time, these networks are in various stages

of development, ranging from limited operation to planning.

One fact stands out as being significant from the viewpoint of industry: extensive portions of the system are services leased from commercial carriers. This is particularly so in the United States. Overseas, government-owned facilities are more common. Industry should keep in mind that to the maximum practicable extent, leased services will continue to be a bulwark of the DCS. Later in this article it should become apparent that the DCS will be quite dependent upon industry for future developments, either through government contracts or through the research and development conducted by industry itself.

Planning for the Future

What do defense communicators foresee for the DCS, and what plans are being made?

Planners of the future Defense Communications System formulate future requirements, and then evaluate the present system in detail to identify system deficiencies. Making a broad assessment of projected technology, it is then determined how this technology can be used to satisfy the requirements and enable the DCS to attain its objectives. This results in a Future Concept. To get from the present DCS to that future DCS there is a Transition Plan. This plan describes the manner in which the DCS will progress from one stage to the next as technology and requirements change. Whenever a point is reached where there is a gap in knowledge or in technology, a requirement for research and development is generated.

This, in turn, becomes the subject for a research project, taking advantage of industry's capabilities wherever feasible.

Planning the future DCS can be considered in four areas:

- Long-range requirements, traffic trends, and objectives of the future.
- A broad look at the future DCS, a concept that will satisfy the requirement and objectives while making the maximum use of projected technology.
- Transition from the present system to the future system at a cost we can afford, while getting maximum use of existing plant.
- Research and development that will, hopefully, advance technology, or prove some techniques and, in general, enhance the chances of attaining our goals.

Objectives of the DCS

Some of the objectives of the DCS are national in scope. Some are dictated by purely military needs and constraints. Some are designed to achieve efficiency and economy in the system while satisfying user requirements. These objectives are:

- To achieve a consolidated, high speed, automatically switched system. The work of the immediate past and presently available technology, economic constraints and immediacy of Service demands has not permitted establishment of such a system.
- To achieve a system with a high degree of survivability and reliability. The system must at all times provide at least minimum essential communications in support of critical command and control requirements. There must be world-wide circuits with sufficient alternate routing and redundancy to establish a highly survivable communications system.
- To achieve, by evolution, traffic flow security for the information transmitted over the system.
- To provide a system capable of accepting varied inputs in any digital language without imposing code con-

version constraints on subscribers. The system must also be capable of accepting analog inputs such as speech.

- To achieve more effective communications in face of natural or man-made disturbances on communications media. Communications techniques must permit normal traffic under disturbed conditions.

Projected Trends

Probably the most difficult task is projecting future military communications requirements. Quantitative requirements are very difficult to obtain; qualitative requirements can be forecast more easily.

Long-haul traffic will continue to increase, imposing demands for transmission of speech and data up to 12,000 nautical miles with adequate quality. Digital traffic will increase, and at a very rapid rate until, eventually, it will comprise the major share. As traffic rises, bit rates must increase, imposing a requirement for better terminal, transmission and switching technologies.

DCS planners anticipate a continuing need for real time switching for data as well as voice. Further, there will be a continuing increase in transmission and processing of various types of data on a real time basis for decision making and command and control.

Greater emphasis will be placed on the capability to rapidly expand and extend the system. This includes the ability to extend communications into remote areas, and to expand existing communications in any area. Military experiences of the past few years have proven the urgent need for this capability.

The demand for all types of terminal devices will increase. Mechanical printers, computers, radar sensors, facsimile, video sets, and similar devices probably will be used in the future.

The overall increase in communications, terminal devices and number of subscribers will, of course, have an impact on transmission security.

The increasing variety of terminal devices, coupled with increased de-

mand for secure voice transmission, will probably result in an increased ratio of digital to analog transmissions in the future system.

All of our requirements will be influenced, and in turn will influence, our requirement to use most effectively any new transmission media, particularly satellites.

Character of the Future DCS

The future DCS can probably be best described as an integrated, high speed, global, switched network, configured on a distributed grid basis, digital in nature, employing time division multiplexing, automatic routing and rerouting, automatic status information, and providing a specified grade of service with automatic preemption capability.

Such a system should satisfy everyone's needs.

The future DCS will be global in nature. Except for certain dedicated networks, the system will be hybrid (analog/digital). It will consist of the four general purpose systems mentioned before, which will provide service for secure and non-secure voice and data communications. The trunking for these networks will be derived to the degree possible through circuit switches common to the system. Transmission facilities will be leased from commercial carriers in the United States and Canada, on transoceanic submarine cables, and from certain foreign carriers where quality and reliability permit. Certain intercontinental links will be leased from commercial satellite facilities.

A wide-band, military satellite transmission system will be operational to provide long-haul links for the DCS through appropriately located ground stations.

Alternate routing capabilities through redundant and diverse transmission facilities will be fundamental to the system. In the Continental United States (CONUS) the poly-grid AUTOVON routing scheme, envisioned for full implementation by 1970, will have been thoroughly evaluated and improved. By 1980, a more adaptive routing scheme for CONUS should be developed.

Switched system users will use military standard data rates. Long-haul trunk and dedicated-user traffic will be transmitted on media capable of handling bandwidths in megahertz with megabits of information.

For planning purposes, consid-



A centuries old cathedral overlooks the billboard-shaped screens of a Defense Communications System tropospheric-scatter communications antenna at Humosa, Spain. The antennas beam microwaves over the horizon by "bouncing" signals in a carefully plotted ricochet off the troposphere into matching antenna screens at a distant station. This installation is operated by a unit of the Air Force Communications Service.

able attention will be directed toward the far Pacific, eastern Asia and Africa. In Europe a continuous upgrading program is anticipated. In the United States, there may be a realignment of facilities and a continuous program of upgrading, expanding, hardening, and testing of new technologies.

New transmission extensions by the DCS in 1980 will result primarily from satellite transmission systems. Short links of laser and millimetric wave transmission will be used in the DCS as test links, but these media may not become widespread during this period.

By 1980, the problems associated with selection of routes through commercial networks will have been resolved, and the CONUS portion of DCS will have been arranged into a more survivable grid pattern of better grade circuits with group restoral capability.

Full utilization and control response of the DCS should be possible by means of a monitor and control subsystem. Real time status reporting by switching centers will be displayed at a central facility which, by means of direct control circuits, will redistribute loads and ensure continuity of command and control circuits. Automatic reporting, with manual control, should be operating on a world-wide basis by 1980. From experience with this system should come the necessary statistical data for a future computer controlled system.

The DCS will remain bandwidth limited on radio circuitry operating below 10 GHz for the foreseeable future. Consequently there is urgent need for techniques for processing more information per cycle of available bandwidth.

The system overall must be capable of reasonable maintenance and logistic support. Its components cannot be so unique or complex of design as to require the training and maintenance of an excessive number of special skills, nor to require excessive spare parts stock.

This, then, is the concept. The next question is: Can we get from the DCS of today to the conceptual system of tomorrow and, if so, how?

The concept must be expanded and evaluated to indicate its demands in terms of technologies, hardware, interface, quantity and quality. The concept must be defined in engineering

terms. In general, it is the philosophy at the Defense Communications Agency to evaluate the feasibility of any such generalized concept as "all digital" or "effectively integrated" by rigorous engineering analysis.

Once the feasibility of a concept has been demonstrated, an attempt is made to ascertain the optimum course of action by appropriate engineering cost effectiveness studies.

At the present time, it is recognized that definitive plans for an effectively integrated, world-wide hybrid system cannot be developed until after the completion of two significant studies:

- Should we develop a new all-digital universal switch? Or should the existing AUTOVON switches be modified to perform digital circuit switch functions?

- What should be the engineering objectives and standards for digital transmission up to 12,000 nautical miles, including the how, where and when time division multiplexing can best be used in the DCS?

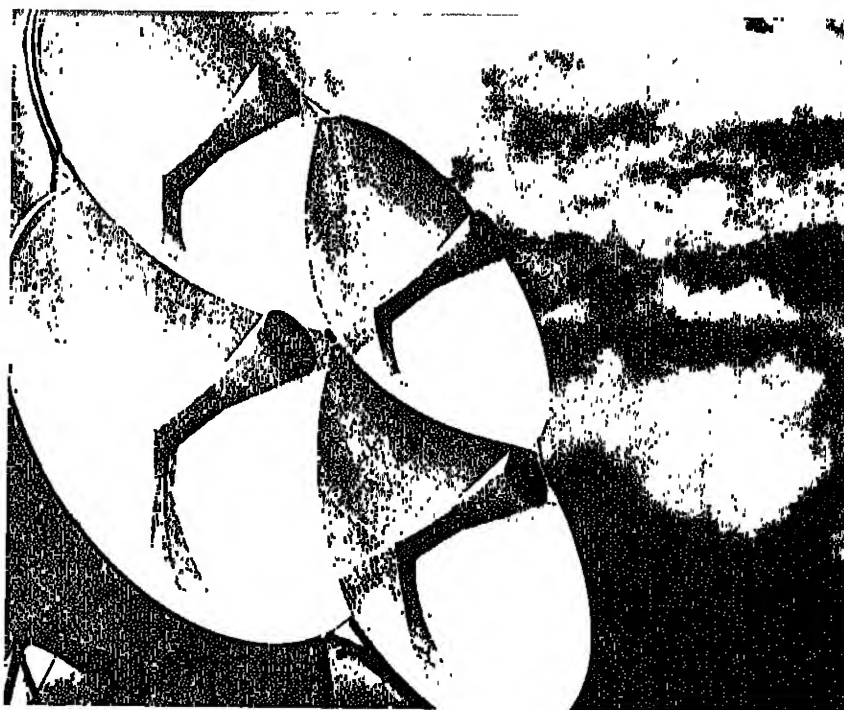
Both of these studies are necessary to the logical evolution of the DCS from its present configuration to a

future hybrid system emphasizing digital techniques. These studies will provide cost analysis and engineering evaluation necessary to substantiate the future concept. Additionally, they will furnish technical and economic tradeoffs of possible alternative methods of attaining our goals for the future DCS.

One other prime consideration at this time is the extent of integration of the individual switched networks. Both near-term and far-term aspects must be considered.

For the near term, integration of the existing DCS subsystems (AUTOVON, AUTODIN, AUTOSEVOCM, etc.) is considered essential to provide DOD with communications facilities which will meet the military requirements of reliability, survivability and efficiency of operations.

For the far term, with the goal of an efficiently integrated world-wide system capable of handling a vast volume of digital traffic, the subject of how much integration is under continued examination.



Cloverleaf shaped antenna of air transportable AN/TSC-54 satellite terminal stands out against sky. The quick-reaction terminal and its six-man crew can be loaded aboard a C-130 transport. At its destination, the crew can assemble the terminal within two hours and be ready for both teletype and voice communication via satellite. These terminals are on duty in several overseas locations.

Research and Development for the Future DCS

Many innovations will be necessary, most of which appear technically feasible, but they are not now available off-the-shelf. This brings us to the final important portion of this article—research and development.

A great deal of research and development work will be needed before we will realize the system described here. Planners at DCA feel that the rapidly advancing communications technology will provide the needed hardware. Even today, industry is developing some of the needed equipment.

Several research and development tasks for the next few years have been identified and merit more detailed discussion.

Recognizing that the trend in transmission will be away from relatively narrowband, high signal-to-noise channels toward wideband, relatively low signal-to-noise channels, with digital regeneration, much effort is being devoted to the need to accommodate the rapidly increasing quantity of digital traffic expected in the future. Areas of DCS-sponsored research relative to this effort are:

- Wideband data tests.
- Digitized voice or analog/digital converters.
- Time division multiplexing.
- Millimeter waves.

In addition, recognizing that technical control is the single most vital part of the communication system and the key to efficient operation, increased emphasis needs to be devoted to development of automatic technical control facilities. These control facilities must be standardized enough to allow simple operation, maintenance and logistic support.

Parallel to these efforts, there is increasing interest in the need for development of transportable communications complexes. These should be designed to provide timely and adequate communications in a variety of contingency situations, and flexibility in planning and installing easily expanded or extended communications sites.

Wide Band Channels Needed

In the past, the basic design criteria for all transmission media have been the 4 KHz channels with telephone inputs in analog form. Data

had been handled as an extra requirement and transmitted through normal telephone procedures. Some progress has been achieved in conditioning circuitry for data transmission. However, the transmission media of the 1970-1980 time frame will be required to carry high-speed data, at extremely low error rates of one part in 100,000 or better, over 12,000 nautical miles. This will require further development of digital transmission techniques and evaluation of the capabilities of future wideband transmission to meet these stringent requirements. DCA has investigated the transmission media to meet our future requirements. The basic conclusion has been that detailed fine grain data on 48 KHz and wider channels are not completely available.

One task is to determine the channel characteristics of 48 KHz and wider channels in a sufficiently fine grain structure to determine the optimum transmission bit rate as a function of error rate. After determining the fine grain transmission media structure, specifications are to be prepared for modems and associated transmission equipment.

The minimum requirements are:

- Determine the current capabilities, based on all available knowledge, of these wideband media to transmit composite data in the 48 KHz or wider channels.
- Determine and define unknown parameters and devise a test program to obtain the required field test data. Obtain the necessary instrumentation, run the required field tests, and evaluate the data.

- Prepare definitive specifications, based upon that test program, for the hardware required by the DCS to obtain the transmission quality that will be needed to meet future user requirements.

Testing on the tropospheric scatter medium has recently been completed and analysis is in progress.

Presently, a similar testing effort is starting on landlines, microwave, satellites and submarine cable.

Analog-Digital-Analog Conversion

With few exceptions, information transmitted on communications channels today is in analog form. Digital data must be converted to analog for transmission, and then be reconverted to digital at its ultimate destination. By transmitting data in a digital

mode, the digital-to-analog (D/A) and analog-to-digital (A/D) conversions will be eliminated. Transmitting in a digital mode will also enhance bulk encryption.

Analog signals will, of course, require conversion for entry into the digital transmission system. Development of converters is another part of the research and development effort.

An important feature of a digital system is the capability of reconstructing the signal at any terminal or relay point along its path. Regeneration not only reconstitutes the signal, but removes accumulated distortion and retimes the signal, thereby permitting substantially greater transmission distances. Regenerators in common use today are designed primarily for teletypewriter circuits, and do not operate at the high bit rates required in the future DCS. Development of general purpose regenerators will permit transmission over substantially greater distances with an acceptable error rate, and will allow the use of less expensive transmission media.

The DCS needs a family of regenerators which can be operated throughout the system at DCA standards prescribed rates. Microelectronic techniques should be used to minimize size and weight, and to reduce power and air conditioning requirements.

A large body of technology has been evolving based on modems, modulation, coding, etc. Effort is now required to develop the optimum combination of these various techniques to provide a standard information language that will permit full-time communication under adverse conditions, while using DCA standards transmission rates. Possibly the outgrowth of this task will be equipment for signal processing, plus storage buffering to obtain maximum information exchange at acceptable performance levels. Studies and tests to determine the characteristics of 48 KHz and wider channels will contribute to this task.

Since most of the data in its original form will be digital in nature, the digitalization of voice is of prime importance, to allow standardization of traffic throughout the DCS transmission network. The necessity for digitalizing voice for security encryption, in itself, warrants further development. The simplification of handling digitalized voice through the

switched network gives even further impetus for developing A/D/A converters.

Analog/digital conversion devices in common use today are all directed toward specific purposes, and require high bit rates to retain the analog quality desired at the receiving end. The need is for general purpose conversion devices to translate voice and graphic signals. Emphasis should be placed on minimizing digital bit rate, reducing size to allow equipment to fit into terminal instruments, and reducing production costs.

Tasks that have been identified are:

- Investigate analog digitalization techniques to determine if high quality analog signals can be transmitted at bit rates of 2,400, 4,800 and 9,600.

- Investigate speech compression/digitalization techniques to determine if it is technically feasible to reduce the size of speech compression and digitalization devices to fit into telephone subsets, while maintaining or improving the quality and intelligibility now obtained with vocoders.

- Based on these investigations, develop a family of standardized converters for voice and facsimile which will be compatible with the future digital DCS. The goal is increased reliability, better performance, and reduced cost.

Time Division Multiplexing

The next major transition in DCS will be to a hybrid analog/digital system. A hybrid time-division-multiplex/frequency-division-multiplex system will be needed to economically handle intermixed digital and analog traffic, while retaining the balance of existing frequency division multiplex equipment of the DCS.

Techniques for time-division multiplexing (TDM) 75 x 2" rate data channels into frequency-division group and supergroup communication channels require study and development. To be investigated under this task are:

- Development of TDM equipment capable of handling data channels with speeds from 75 bits per second up to 1.228 Mbs and, if future needs dictate, higher rates. While DCA is concentrating on 75 x 2" rates, industry is investigating some other rates. DCA planners watching these disparities will periodically review DCS needs and investigate other

modulation rates to insure full utilization of the bandwidth available.

- Development of techniques to provide 50 microsecond channel envelope delay. This effort will increase the data capabilities of frequency division multiplexing (FDM) equipment as well as permit more orderly and more economical development of TDM systems.

A feasibility model of a TDM multiplexer is scheduled for delivery shortly. A study to determine how this device will fit into the evolutionary conversion of the DCS from analog to digital transmission is in progress and will be completed shortly.

Millimetric Relay Systems

With the advent of very wideband terminal devices, there will develop requirements to net various numbers of these devices in highly concentrated areas. New techniques and equipment to use millimeter wave bands offer great inducement to investigate this area. Possible longer distance transmission can be achieved by using the relatively shorter millimetric wave paths in the same manner that conventional microwave relay systems are used today.

DCA presently has underway in the Washington area a test program to determine the technical and operational feasibility of millimetric wave propagation. Results to date have been promising. With the completion of this work, a Military Department will assume responsibility for further study and testing. It is intended that this effort will conclude in a recommendation for a proposed system and for follow-on development and evaluation of a prototype.

An operational millimetric system will provide the DCS with even greater bandwidth than conventional microwave systems and will make possible simultaneous transmission of many secure television, wideband facsimile and voice channels.

The effort so far described will have application to satellite links also. There are several study efforts comparing coherent versus non-coherent modulation schemes for satellite transmission. These studies also consider the peculiar requirements of mobile and fixed terminals.

Technical Control Needs Modernization

The DCS must remain operational under conditions of stress caused by either natural or man-made phenomena. Thus it must be adaptable to automatic routing and control. The present DCS is primarily manual. Because of the scope of the data needed to maintain the status of the net, it will be beyond the capability of the human by himself. Modernization of the technical control facility has not kept pace with changes in the size of the system and the basic hardware entering the system.

Reliability and efficiency of the DCS must be improved by continually monitoring all circuits, on a non-interference basis, and automatically switching traffic from deteriorating to adequate circuits as required to assure maximum information transfer. Presently, there is planning in progress to update existing facilities with more modern and partially automatic equipment. Simultaneously, a research and development program is underway on a system using the maximum profitable amount of automation.

The initial study effort will determine the degree of automation feasible for adaptation by technical control facilities. The study will use a



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typical operating facility to determine optimum parameters for assessing equipment/channel performance, and the availability or need to develop sensing devices for measuring the parameters. Functions of such equipments as data processors, displays, peripheral devices, automatic patching equipment, monitor consoles, line conditioning equipment, etc., will be established. The availability of such equipment, or the need to develop it, will also be determined. Then research and development will be started on a model technical control system employing all the automatic features which have been determined desirable and feasible. The model will be installed in an operational technical control facility to determine its suitability as the standard system for the DCS.

Transportable Communications Packages Needed

There is great need in the DCS for transportable communications complexes. They can be classified into two types: lightweight compact facilities and heavy facilities. The borderline between the two is somewhat vague but is essentially determined by traffic handling capacity and the duration of use. The heavy system should be capable of indefinite operation as a permanently fixed installation.



Lieutenant Colonel Richard S. Barry, USMC, is Chief, Development and Special Plans Branch, Defense Communications Agency, Arlington, Va. 20304. Prior to this assignment, he was in the Office of Communication-Electronics, Fleet Marine Force, Atlantic, at Norfolk, Va. He holds both B. A. and M. A. degrees in history.

Contingency systems composed of existing inventory are already under development. The need is for a lighter weight station with all the capabilities of those stations presently being assembled. A desirable addition is a small digital message switching capability.

Presently, a cost and worth study is underway to determine where the most practical size reduction can be achieved. This will be followed by a Technical Development Plan. Finally, hardware development will be identified.

There is a simultaneous interest in developing a family of standard heavy transportable communications equipments of various sizes and capabilities which can be used to configure or reconfigure fixed communication stations and transmission systems. This will provide commonality and compatibility.

The technical concept of a family of heavy transportables is based on the recognition that the long-haul fixed system of the DCS encompasses a broad range of transmission, technical control and switching requirements. This broad range dictates that the family of heavy transportable equipment must be composed of building blocks, which can be assembled to provide facilities appropriate to the particular global operation or environment. Each block should be a functional communications module which could be used for replacement, restoral, or capacity increase, or used with other modules to establish partial or complete facilities or stations.

The shelters to house this modular equipment should be sufficiently flexible to allow expansion or reconfiguration as any specific communications mission may require. In addition to satisfying the broad range of communications requirements, the heavy transportable equipment must preserve the human engineering factors associated with the fixed station environment.

The family of transportables, in ultimate configuration, would have every capability that the DCS now possesses.

It appears that the techniques and components capable of doing the job are already existent. The development of heavy transportable equipment for near-term applications is predominantly a packaging job, or en-

gineering development. A Technical Development Plan is just now getting underway for delivery next year. The plan will define equipments and configurations for the ultimate system.

With the availability of the Technical Development Plan, development, test evaluation, and service testing will follow in that order, resulting in a family of modules capable of fulfilling many missions in many configurations.

Future DCS research and development can be summarized into five areas:

- Advanced multiplexing techniques.
- Transmission media.
- Regenerative repeaters.
- Switching equipment.
- Modular equipment packages.

The objective is a system that is expandable on a world-wide scale, highly survivable and standardized to the greatest possible extent. Some of this research and development will be done within the Government, and some through contracts; however, the future of the DCS will also be dependent upon the research and development conducted by industry itself.

New Functions Given to ARADCOM Field Office at Redstone

The Army Air Defense Command has expanded its liaison office at Redstone Arsenal, Ala., and changed its designation to that of field office.

Expansion of the office came as a result of the establishment of the Sentinel Ballistic Missile Defense System Command Headquarters at Redstone Arsenal.

A major function of the new office will be the continued coordination between the Army Air Defense Command and the Army Missile Command at Redstone, concerning anti-aircraft missile systems now operational or in development.

The field office will also serve as a point of contact between the Army Air Defense Command and other organizations located at Redstone.

Colonel James W. Young, former Air Defense Command Liaison Officer, heads the new field office.

Value Engineering

(Continued from page 4)

() Do you conduct formal value engineering workshops to expand your in-house capabilities?

Few, if any, of the major corporations in the defense industry today can affirmatively answer all of these questions, but the more successful contractors can generally answer many more of these questions in a positive fashion than can those companies with lesser performance records.

Honeywell Ordnance experience is an excellent example of the mutual benefits that industry and DOD can obtain from value engineering incentive provisions. Its experience and the experience of several other leading companies have demonstrated that VECs offer a sizeable potential for augmenting defense industry income if top management will take the actions necessary to realize the potential, and organize and commit proper resources to a sustained VEC effort.

Defense industry management is increasingly "sitting down" with key DOD personnel to review the mutual advantages of VECs, and to agree on "local ground rules" for volume submission of VECs. With proper support from both industry and DOD, value engineering contract incentives may well become a major entrepreneurial innovation of our current times.

VSX Definition Contractors Selected

The Naval Air Systems Command has selected two contractors to perform contract definition effort for the VSX (Developmental Antisubmarine) weapon system.

Contracts totaling \$19 million will go to Convair Division of General Dynamics Corp., San Diego, Calif., and Lockheed-California Corp., Burbank, Calif., teamed with Ling-Temco-Vought Aerospace Corp., Dallas, Tex.

The VSX is envisioned as a carrier-based antisubmarine warfare aircraft to replace the S-2 Tracker, a twin reciprocating engine plane.

Computers for the VSX will be capable of analyzing underwater sounds and other required sources of information and presenting the data on television-type displays for interpretation.

Man in the Sea

(Continued from page 9)

which will be used in the experiment.

As D-Day—meaning "down day"—approached, the 40 aquanauts were selected and divided into five teams. Groups of aquanauts began traveling to the San Francisco Bay Naval Shipyard about six months before the experiment was scheduled to begin to take part in systems integration tests. These tests, about six weeks in duration, made certain that all parts of the equipment—the support ship, diving system and habitat—fit together. Each aquanaut is responsible for knowing his own equipment, such as Mark VIII Scuba, wet suit, and equipment related to his own bottom work. He must also know the multitude of gauges, valves, levers, plugs, outlets, switches and indicators installed in the habitat and, to a lesser extent, in the diving systems.

Two weeks before the experiment begins, the surface support ship and habitat will be moved to the Long Beach Naval Shipyard for shallow water tests. There the habitat will be lowered to a depth of about 45 feet and the entire SEALAB III complex will be connected for integration tests. At Long Beach, the aquanauts

will receive on-the-job training. Throughout this period of equipment tests, the aquanauts themselves will continually undergo examinations at nearby naval hospitals and at DSSPTO.

A few days before the experiment begins, the surface ship, habitat, support craft and aquanauts will move to the test site off San Clemente Island, where the habitat will be lowered to the bottom.

Aquanauts will assist the support ship personnel and support divers in handling the habitat and in rigging the life support and communications umbilicals between the support ship and the sea floor habitat, and between the habitat and San Clemente Island. These last minute activities will give the aquanauts a final look at the status of the various components of the SEALAB III complex. Then, two of the aquanauts of the first eight-man team will descend to the ocean floor and will enter the habitat. After a final check of the habitat's equipment, they will declare the habitat ready for their fellow team members.

Training ends there. SEALAB III—man's most ambitious effort to explore and exploit the ocean depths by living on the ocean floor—will be underway.

AIAA Annual Meeting Set for Oct. 21-24 in Philadelphia

The military's traditional role as the cutting edge for new technology will be demonstrated during the annual meeting of the American Institute of Aeronautics and Astronautics (AIAA).

The meeting and its associated technical display of aerospace hardware, concepts and capabilities will be held Oct. 21-24 at the Civic Center in Philadelphia, Pa.

Brigadier General R. A. Gilbert, Director of Laboratories for the Air Force Systems Command, will act as chairman of the opening session, which is entitled, "Aerospace Technology—the DOD Point of View."

Others presenting papers during the first session will be Brigadier General Charles D. Y. Ostrom Jr., Director of Army Research, Office of the Chief of Research and Development; Rear Admiral Thomas B. Owen, Chief of Naval Research; and Brigadier General Leo A. Kiley, Commander of the Office of Aerospace Research.

Technical thrust of the meeting will focus on four multi-discipline themes plus a related technical specialist program. The themes are: "Expanding Air Transportation," "Renaissance in Aircraft Design," "The Space Program—Today and Tomorrow," and "Special Issues."

Special tours for scientists and engineers who work in the Pentagon and at other military and government installations in the Washington, D.C., area, are being arranged by the AIAA.

Information concerning tours can be obtained by calling Raymond E. Forbes of the General Electric Co., Washington, D.C., Phone (202) EX 3-3600. Additional information on the meeting may be obtained from the Public Affairs Department, American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, N.Y. 10019.



MEETINGS AND SYMPOSIA

OCTOBER

Matrix Methods in Structural Mechanics Conference, Oct. 15-17, at Wright-Patterson AFB, Ohio. Co-sponsors: Air Force Flight Dynamics Laboratory and the Air Force Institute of Technology. Contact: Mr. Berke (FDTR), Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55651.

Second International Meeting on Silicon Carbide, Oct. 21-23, at Pennsylvania State University, University Park, Pa. Sponsors: Air Force Cambridge Research Laboratories, Pennsylvania State University and the Carborundum Co. Contact: C. E. Ryan, Air Force Cambridge Research Laboratories (CRWF), L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 2234.

Explosive Chemical Reactions Seminar, Oct. 21-23, at Durham, N.C. Sponsors: Army Research Office, Air Force Systems Command and the Naval Ordnance Laboratory. Contact: James Norman, Dir., Research and Technology Div., Army Research Office, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285, Ext. 22 or 44.

Successful Application of Value Engineering, Annual Meeting of the Value Engineering Div., American Ordnance Association, Oct. 23-24, at Andrews AFB, Md. Contact: Col. John Dickson, American Ordnance Association, Transportation Building, 17th and H Streets, N.W., Washington, D.C. 20006, Phone (202) 347-7250.

International Electron Devices Meeting, Oct. 23-25, at the Sheraton-Park Hotel, Washington, D.C. Sponsor: Institute of Electrical and Electronics Engineers Electron Devices Group. Contact: Dr. B. J. McMurtry, Sylva Electronic Systems, P.O. Box 188, Mountain View, Calif. 94040, Phone (415) 966-2855.

Engineering Aspects of Solidification Meeting, Oct. 28-30, at Boston, Mass. Sponsors: Army Materials and Mechanics Research Center, American

Society for Metals and American Foundrymen's Society. Contact: Dr. Paul J. Ahearn, Army Materials and Mechanics Research Center, Watertown, Mass. 02172.

NOVEMBER

International Symposium on Equatorial Aeronomy, Nov. 2-10, at Ahmedabad, India. Sponsors: Office of Aerospace Research, Voice of America, Cambridge Research Laboratories, and Environmental Science Services Administration. Contact: Edwin J. Chernosky, Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730, Phone (617) 274-6100, Ext. 3714.

Science, Philosophy and Religion—Weapons Technology Conference, Nov. 13-15, at Kirtland AFB, N.M. Sponsor: Weapons Laboratory, Air Force Special Weapons Center. Contact: Lt. Col. Rizzo, Air Force Weapons Laboratory (WLRP), Kirtland AFB, N.M. 87117, Phone (505) 247-1711, Ext. 2320.

DECEMBER

Reliability Physics Symposium, Dec. 2-4, at Washington, D.C. Co-sponsors: Institute of Electrical and Electronics Engineers and Rome Air Development Center. Contact: J. Vaccaro (EMERP), Rome Air Development Center, Griffiss AFB, N.Y. 13440, Phone (315) 330-2813.

International Wire and Cable Symposium, Dec. 4-6, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Army Electronics Command. Contact: Milton Tenzer, Electronic Parts and Materials Div., Electronic Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. 07703, Phone (609) 535-1834.

JANUARY

Titanium Coordination Meeting, (date undetermined), at Wright-Patterson AFB, Ohio. Sponsor: Air Force Materials Laboratory. Contact: Dr. H. L. Gegel, Air Force Materials

Laboratory (MAMS), Wright-Patterson AFB, Ohio 45433, Phone (513) 255-2624.

Fundamental Interactions at High Energy Meeting, Jan. 22-24, at the University of Miami, Coral Gables, Fla. Sponsor: Office of Scientific Research. Contact: Capt. D. R. Lehman, Air Force Office of Scientific Research (SRPN), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) Oxford 4-5581.

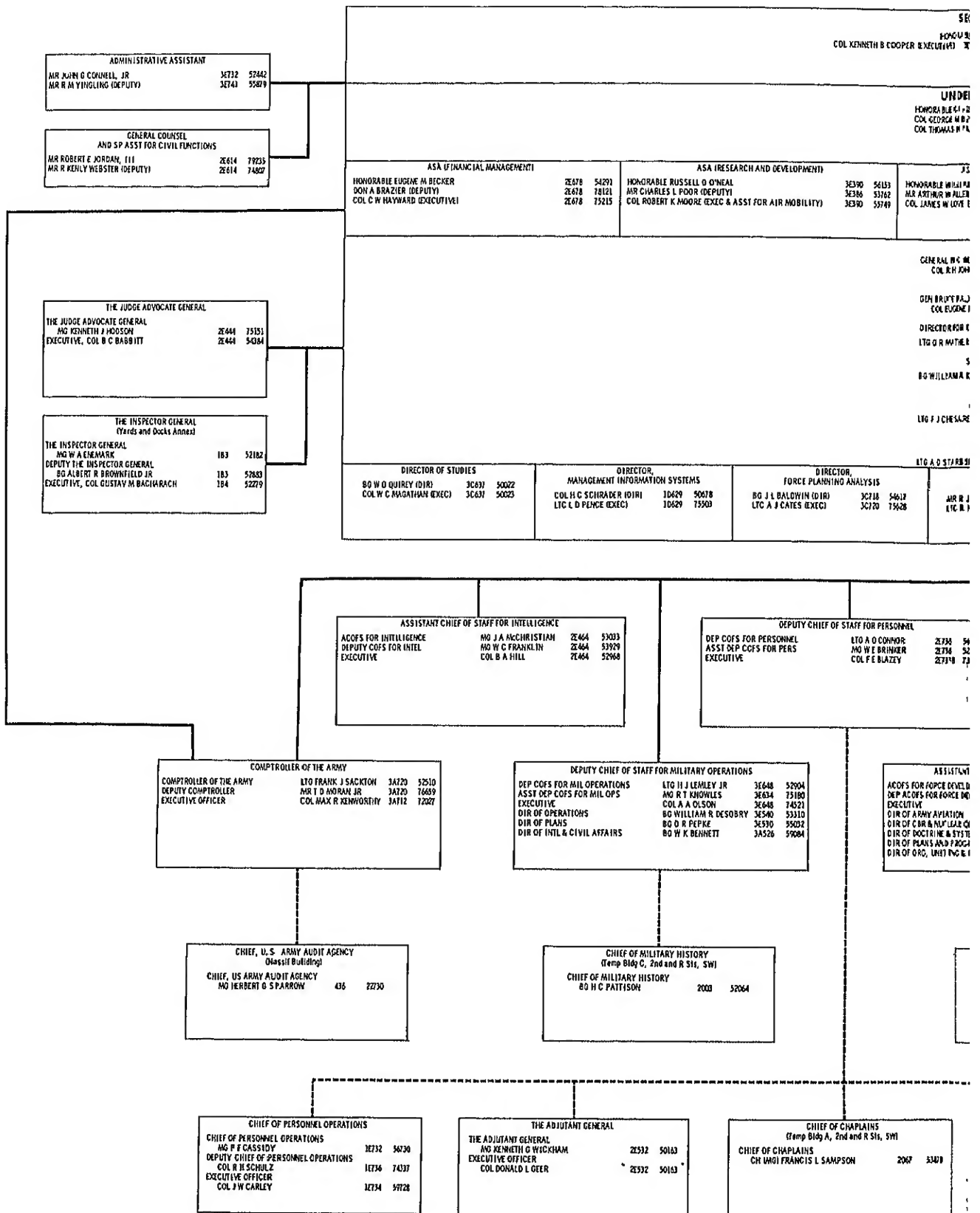
Telemetry Meet Set IEEE Calls for Papers

Authors have two and one-half months remaining to write and submit papers for the 1969 National Telemetry Conference. The Institute of Electrical and Electronics Engineers has issued a call for papers to be presented at the April 22-24, 1969, conference in the Washington Hilton Hotel, Washington, D.C. The theme is Telemetry in the 70s.

Papers are invited on five areas: aerospace, oceanographic, biomedical, and industrial/environmental telemetry, and communication technology. Papers should be limited to 4,000 words and six illustrations, and should be submitted in two complete copies, with three copies of an abstract not exceeding 100 words. Submissions must reach the Technical Program Chairman before December 20, 1968. He is Dr. Robert W. Rochelle, NASA-Goddard Space Flight Center, Code 710, Greenbelt, Md. 20771, Telephone (301) 982-4615.

Authors will be notified of acceptance by Feb. 3, 1969, and will be provided with a guide and paper preparation kit for the final manuscript.

Exhibits of the latest telemetry hardware, instruments and components are planned for the meeting. Further information is available from Ralph Whitener, National Telemetry Exposition, 1040 Shoreham Building, Washington, D.C. 20005, Telephone (202) 347-0425.





ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Brig. Gen. Leo E. Benade, USA, has been appointed Dep. Asst. Secretary of Defense (Military Personnel Policy) in the Office of the Asst. Secretary of Defense (Manpower and Reserve Affairs).

Col. John H. Burke, USA, has been named Inspector General of the Military Traffic Management and Terminal Service (MTMTS).

In another change at MTMTS headquarters, Col. William E. Burton, USA, replaced Col. Henry G. Dettmar, USA, as Dir. of Passenger Traffic.

Capt. Robert R. Campbell, USN, is the new Commander, Defense Con-

tract Administration Services Region, Boston, Mass.

Capt. Edgar C. Chapman Jr., USN, has assumed duties as Chairman, Armed Service Procurement Regulation Committee in the Office of the Asst. Secretary of Defense (Installations and Logistics).

Capt. Murry Cohn, USN, has reported to the Defense Contract Administration Services Headquarters, Alexandria, Va., for duty as Chief of the Production Management Div.

Col. Raymond B. Furlong, USAF, has been named Mil. Asst. to Dep. Secretary of Defense.

Capt. Harold W. Simpson, USN, has been assigned as Commander, Van Nuys Dist., Defense Contract Administration Services Region, Los Angeles, Calif.

RAdm. Jack J. Appleby has taken command of the Naval Supply Center, Oakland, Calif.

RAdm. Charles A. Blick, head of the Navy Resale System and Commanding Officer, Navy Ship's Store Office, (NSSO) Brooklyn, N.Y., has retired from active duty after more than 35 years service. Capt. John E. Morrissey, NSSO Executive Officer, will act as temporary commander.

RAdm. Donald G. Irvine is the new Commandant of the Naval District, Washington, D.C.

RAdm. Robert A. MacPherson has been assigned as Commandant of the Eighth Naval District.

Capt. James D. Mooney has taken over as Dep. Vice Commander, Pacific Missile Range, Point Mugu, Calif.

Capt. Edward C. Oldfield Jr., has relieved Capt. Grover V. Clark as Commanding Officer, Naval Supply Center, Newport, R.I.

The Bureau of Naval Personnel has also announced the following assignments: Capt. William D. Baker, Commanding Officer, Naval Ammunition Depot, Hawthorne, Nev.; Capt. Greer A. Busbee Jr., Commanding Officer, Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C.; Capt. Hollis W. Cooley, Officer-in-Charge, Cheatham Annex, Naval Supply Center, Norfolk, Va.; Capt. Henry E. Davies Jr., Commanding Officer, Naval Ammunition Depot, Oahu, Pearl Harbor, Hawaii; Capt. John C. Donahue, Commanding Officer, Naval Ammunition Depot, Crane, Ind.; Capt. John H. Garrett Jr., Commanding Officer, Navy Electronics Supply Office, Great Lakes, Ill.; and Capt. Charles J. Merdinger, Commanding Officer, Western Div.; Naval Facilities Engineering Command, San Bruno, Calif.

DEPARTMENT OF THE AIR FORCE

The following personnel have been assigned to the Air Force Systems Command (AFSC), Air Force Logistics Command (AFLC), and the Office of Aerospace Research (OAR):
(Continued on page 30)

DEPARTMENT OF THE ARMY

Brig. Gen. Wallace L. Clement has been named Chief of Staff, Army Combat Developments Command (CDC), Fort Belvoir, Va. Col. Charles B. Hazeltine Jr., was assigned as Dep. Chief of Staff. The assignments resulted from realignment of the CDC's command structure.

Col. Robert H. Clagett Jr., has assumed the position of Dep. Commander, Army Strategic Communications Command—CONUS. He replaces Col. Joseph T. Adinaro.

Col. John R. Oswalt Jr., has succeeded Col. Edward G. Anderson Jr., as Commanding Officer, Army Engineer Topographic Laboratories, Fort Belvoir, Va.

Col. Arthur H. Sweeney Jr., has been appointed as the new Dep. Commanding General, Army Weapons Command, Rock Island, Ill.

Col. George W. Casey, Dep. Dir. of Doctrine, Army Combat Developments Command, Fort Belvoir, Va., has been nominated for promotion to brigadier general.

DEPARTMENT OF THE NAVY

VAdm. David C. Richardson, now serving as Asst. Dep. Chief of Naval Operations (Air), has been selected as Commander of the U.S. Sixth Fleet.



Robert C. Moot was sworn in as Asst. Secretary of Defense (Comptroller) on Aug. 1. He succeeds Robert N. Anthony who resigned to return to the faculty of Harvard Business School.

Mr. Moot has been Administrator of the Small Business Administration since Aug. 1967, serving first as Dep. Administrator beginning in Dec. 1966. From 1962 to 1965 he was the first Comptroller of the Defense Supply Agency. In June 1965, Mr. Moot was appointed Dep. Asst. Secretary of Defense for Logistics Services, a position he held until he moved to the Small Business Administration. He has been in Federal service since 1946.

DOD Lists Factors Indicating Contractor Compliance with Equal Opportunity Requirements

The Defense Department has released a list of factors, conditions and practices which indicate the degree of compliance by Federal contractors with the equal employment opportunity requirements of Executive Order 11246.

Factors cited include such items as recruiting practices designed to attract minority groups, interviewing techniques which avoid bias, non-discriminatory test criteria and training programs, equality in facilities, and fair appraisal procedures.

The factors are for use by officials of the Contracts Compliance Office, part of the Defense Supply Agency's Defense Contract Administration Services, in conducting compliance reviews required under the rules which implement the Executive Order (Chapter 60, Title 41, Code of Federal Regulations).

Purpose of the compliance reviews is to determine if prime contractors and subcontractors maintain nondiscriminatory hiring and employment practices.

The listing of factors is intended to assist the reviewer in his task of bringing into focus those aspects of a contractor's program that must be considered if a reliable judgment is to be made regarding the contractor's compliance.

However, the factors listed do not represent all actions and practices which a contractor might undertake in support of the equal employment program. Conversely, the absence of any of these factors does not necessarily establish a condition of non-compliance. Each finding that results from the application of the items in the listing to an actual plant situation must be related to other findings. The total findings then must be related to actual results in terms of the employment of minority applicants and the non-bias treatment of employees. It is the results which will determine whether the contractor is complying with the Executive Order.

Offices of Contracts Compliance are established in the 11 regional offices of the Defense Contract Administration Services across the country. The offices are responsible for elimination of discrimination by Federal contractors.

The following factors indicate compliance.

Contractors' Policy Implementation

- Company policy exists in writing in precise terms.
- Policy is reflected in external dealings with labor unions, recruitment sources and subcontractors (including use of equal employment opportunity clause in purchase orders).
- Policy is reflected in internal dealings through employee booklets, bulletin boards, house publications, supervisors' training, employee representatives, and the posting of equal employment opportunity notices.
- Certification is received, prior to the award of any non-exempt subcontract, of non-segregation of facilities [41 Code of Federal Regulations 60-1.8 (b)].
- Responsibility for equal employment opportunity is defined for each level of management.

Personnel Recruitment

- The "Equal Opportunity Employer" line is included in recruitment advertising.
- Minority group sources are contacted to stimulate applications and consistent liaison is maintained with these sources.
- Job opportunity information is made equally available to minority group and non-minority group applicants.
- Recruitment offices are easily found, well-marked, and accessible to applicants.
- Employment qualification requirements are not inflated.
- Application and filing procedures

are not so complicated as to discourage minority group applications.

- Records are maintained as to applications received and the disposition made of them.

Personnel Interviewing and Processing

- All applicants are treated equally with regard to being permitted to complete application forms.
- Minority group applicants are not kept waiting longer than non-minority group applicants.
- Application forms are not marked to indicate race.
- Application form questions are not designed to discover race, religion or national origin (color of hair or eyes, memberships in organizations, etc.)
- Applicants are not required to furnish photographs.
- Standards of eligibility for hire or selection are objective and clearly defined.
- Applicants' questions regarding standards of eligibility are answered.
- Applicants are notified of their eligibility or ineligibility.
- Interviewing personnel are qualified in the responsibility to evaluate capabilities and the task is not delegated to persons not qualified for the function, such as guards or receptionists. Ideally, there may be Negro or Spanish-speaking interviewers.

Personnel Testing

- Tests are job-related.
- Tests are validated for minority groups (no cultural bias).
- Written tests are not used exclusively to ascertain eligibility for hire or promotion.
- There is a single standard for rating tests.
- Minority group applicants are not tested when non-minority group candidates are exempted.
- Applicants are advised of the test scores needed for acceptance and of their own scores.

Placement and Lines Progression

- Employee classification and organization allows minority group employee full participation in promotion and transfer opportunity.
- There are no dead-end lines of progression made up exclusively or predominantly of minority group employees.
- Functions that have a normal place in non-minority lines of progression are not isolated into separate minority group lines.
- Minority group employees are properly classified, allowing a line of progression that will maintain their promotion opportunity.
- There are no discriminatory impediments to the movement into, out of, and within progression lines.
- All employees are acquainted with matters governing promotion, demotion, lay-off, or terminations.

Salary and Wage Plans

- Classification and compensation of minority group employees are equal to and consistent with that of non-minority group employees performing like work.
- Wage rates for jobs filled mainly by minority group members are the same as those occupied predominantly by non-minority group employees.

Training

- Minority group employees are neither excluded from training programs nor are they under-represented.
- Apprenticeship training is provided when such programs are needed to insure equal employment opportunity for minority group employees.
- Training programs are provided for minority group employees in helper positions.
- Training needs of minority group employees are determined through qualification review programs.

Employee Rating

- Employees are informed of the criteria against which performance is evaluated.
- Performance criteria and rating standards are nondiscriminatory against minority group employees.
- Procedures exist for employee appeal from an adverse performance rating.

Disciplinary Actions and Separations

- Employees are informed of policies and procedures governing disciplinary actions.
- A table of standard penalties has been established.
- Equal penalties are imposed for like offenses.
- All employees are given advance notice of disciplinary actions and are given opportunity to make reply to a specific charge.
- All employees are accorded an explanation of why his answer to a specific charge is considered unsatisfactory, before disciplinary action is taken.
- Disciplinary action is proportionate to the nature of the offense.

Segregation of Facilities

- Contractor policies and practices must insure that segregation of facilities will not occur.

- Employees are not assigned to work where facilities, under control of the contractor, are segregated.
- De facto segregation, through custom, is not tolerated.
- Facilities (wash rooms, locker rooms, time clocks) are not reserved for designated groups, either by sign or established practice or custom.
- The contractor denies sponsorship to any establishment, social center, golf course, swimming pool, etc., that follows a policy of exclusion of any minority group.
- The contractor denies sponsorship to any social or athletic event at a private establishment that follows a policy of exclusion of any minority group.

Correction of Prior Deficiencies

- The contractor has taken satisfactory measures to correct compliance deficiencies noted in any prior compliance review.

12th Naval District Headquarters Moved to Treasure Island

Commandant, 12th Naval District, Rear Admiral Leo B. McCuddin, and his staff have moved from the Federal Office Building in downtown San Francisco to new headquarters at the Treasure Island Naval Station.

The move is in connection with a master plan for maximum use of Treasure Island that will consolidate naval activities in the area at a central location.

Since the Commandant, 12th Naval District, is also Commander Naval Base, San Francisco, and Commander, Central District Defense Group, Western Sea Frontier, the mailing address for all titles is now:

Building 450
Treasure Island
San Francisco, Calif. 94130

This address may also be used for the Naval Regional Finance Office which will occupy the same building.

The 12th Naval District is one of 15 naval districts, (including the Washington Naval District), that divide the continental United States and a few overseas areas into geographical sections. It encompasses the northern part of California, all of Utah and Nevada, excluding Clark County.

Navy Awards Contract for DLGN Frigates

Newport News Shipbuilding and Dry Dock Co., Newport News, Va., has been awarded a negotiated fixed-price incentive contract for the design and construction of two guided-missile nuclear-powered frigates.

Total target contract price is estimated at \$143,500,000. Work will be performed at Newport News.

The ships will be equipped with the most advanced sonar and anti-submarine warfare (ASW) weapons, as well as two dual Tartar surface-to-air missile systems, providing an effective combination of both anti-air warfare and ASW capabilities. They will also be equipped with conventional naval guns providing multi-purpose escort capacity.

Army Expands Night Vision Center

The Army is expanding its Combat Surveillance, Night Vision and Target Acquisition Laboratories at Fort Belvoir, Va., with the construction of two buildings. One will serve as a night vision simulator building and the other as a far infrared laboratory.

Both projects are expected to be finished in September 1969.

Management Training Aids Help Strengthen Small Business Firms

Clyde Bothmer

[Editor's Note: This is the fourth in a series of articles for small business defense contractors by Clyde Bothmer, Deputy Associate Administrator of the Small Business Administration.]

The Small Business Administration's (SBA) management training program is closely related to the management counseling effort described in the preceding article of this series (see article "Management Counseling for Small Business," *Defense Industry Bulletin*, September 1968, page 27). That article pointed out that group counseling by management assistance officers is a principal method for providing basic information to a wide audience.

During the last fiscal year, SBA provided more than 2,500 units of training with an attendance in excess of 84,000. It would be impossible to properly counsel on a person-to-person basis the large groups implied by these figures. SBA's capability to inform potential and active small business owners and managers on an individual basis would be severely reduced without the material provided for small business management training: more than 800 titles on various aspects of management. Although the primary function of these materials is to train small businessmen, universal management principles are stressed in the publications, making many of them potentially useful to any manager who needs to fill in gaps in his education or experience.

The SBA management assistance materials are leaflets, booklets, and films. They are designed for three types of audiences: small business managers and potential managers, small business management teachers, and small business advisers.

All of these materials stress principles of management rather than operating techniques. A recent example of this emphasis is an article, "Should You Make or Buy Components," which was released in the

Management Aid for Small Manufacturers series. This eight-page leaflet discusses the cost element which the owner of a small plant needs to examine when considering whether to make or buy. When he understands the principle, he can apply it to whatever changes advancing technology may bring to the manufacture of components.

Frequent approving comments from users about the authenticity of information point to another thing which SBA's management educational materials have in common. Authors are independent experts, writing from current, practical experience in their subject. They are encouraged to give pragmatic suggestions and "how-to-do-it" advice.

Since 1953, when the agency began publishing management assistance information, SBA's authors have come from accounting firms such as Haskins & Sells and Alexander Grant and Co.; from associations such as the American Marketing Association, the National Safety Council, and the American Institute of Architects; from banks such as the Chase Manhattan Bank and the First National Bank of Chicago; from companies such as Gates Rubber Co., American Optical Co., and American Telephone and Telegraph; from consulting firms such as H. B. Maynard Co., Sander-son & Porter, Inc., and Arthur D. Little; from universities such as the University of Denver, St. Edward's University, and the Harvard Graduate School of Business Administration; and from government agencies such as National Aeronautics and Space Administration and the Internal Revenue Service.

Publications for Small Business Managers

SBA publishes four leaflet series and two booklet series for small business managers or potential managers. Each seeks to fill a distinct need in the small business community.

Among the leaflet series, the old-

est is Management Aids for Small Manufacturers. This series deals with the functional problems in small plants and concentrates on subjects of interest to administrative executives. More than 190 titles are published. Examples are "Using Census Data in Small Plant Marketing," "Measuring the Performance of Salesmen," and "Checklist for Developing a Training Program."

Another leaflet series of interest to members of the defense-industry team is Technical Aids for Small Manufacturers. This series is intended for top technical men in small companies. In many small firms, the administrative and technical officials are one and the same; in others there may be a technical specialist to supervise that part of the company's operations. Examples of titles are "Value Analysis for Small Business," "Inspection on Defense Contracts in Small Plants," and "Controlling Quality in Defense Production."

The remaining two leaflet series are designed for owners of non-manufacturing businesses. One, the Small Marketers Aids, concentrates on subjects of interest to administrative executives of small, retail, service and wholesale firms. The other, Small Business Bibliographies, are devoted to individual types of businesses. Directed primarily to prospective owner-managers (individuals who seek to enter business for themselves), those bibliographies also include a description of operating procedures in the subject named business.

The Small Business Management series is the oldest of the three booklet series that are primarily for the individual reader. These booklets present a more comprehensive discussion of special management problems in small companies than is possible in an eight-page leaflet. Of the 33 volumes, typical titles are "A Handbook of Small Business Finance," "Ratio Analysis for Small Business," "Profitable Small Plant Layout,"

and "Small Store Planning for Growth."

The Starting and Managing series of booklets differs from the other booklets in that each volume describes the problem of starting and operating a specific type of enterprise. The single exception is the first volume in the series, "Starting and Managing a Small Business of Your Own," which is general discussion. Examples of titles are "Starting and Managing a Service Station," "Starting and Managing a Small Automatic Vending Business," and "Starting and Managing an Aviation Fixed Base Operation."

The Aids Annuals series of booklets furnishes the small business owner-manager with a permanent source of the material originally published in the Aids series. The 24 volumes in this series are compilations of individual issues from the three Aids series. The Management Aids for Small Manufacturers Annuals and the Small Marketers Aids Annuals contain publications from their respective series published during a previous year. The periods covered by the Technical Aids for Small Manufacturers Annuals are somewhat longer.

Publications for Small Business Teachers

SBA publishes various educational materials for small business teachers—individuals who instruct in management courses which SBA co-sponsors with universities, business schools, trade associations, and other organizations.

One example of this type of material is the Coordinator's Kit. In addition to containing information on methods for starting courses, this kit offers teaching aids. Among them are case studies, lectures, and outlines.

Management Course Presentations are another type of materials for small business teachers. Covering various management subjects, each volume is designed to help the course leader in preparing one or more sessions on a particular management subject. The package includes a teaching outline, a text, visual aids, handout materials for class members, case material, suggested homework assignments, and a bibliography. Examples of titles are "Personnel Management: Developing Good Employees," "Effective Advertising," "Safeguarding Your Business and Management Succession," and "Why

Customers Buy (and Why They Don't)."

SBA also provides scripts and visuals for overhead projection for workshops for prospective small business owners. The agency has a series of color films on advertising and sales promotion. Produced to SBA's specifications by an outside contractor, typical titles are "The Advertising Question" and "The Calendar Game."

SBA also produced a series of black and white films which deal with various aspects of management. Ten films make up this series which tells the story of a young man who seeks advice on going into business for himself with the money he has inherited. Examples of titles are "Functions of the Manager," "Purchasing, Pricing, Inventory Control," and "Planning for the Future." This series is also available on tapes for television broadcasting. The movies and tapes are loaned for SBA co-sponsored training sessions.

Materials for Small Business Advisers

Two series of printed material have the purpose of informing small business advisers—accountants, lawyers, bankers, consultants, and others who work closely with the owners of small companies—the Small Business Management Research series and Management Research Summaries.

The booklets in the Small Business Management Research series represent the results of academic or other professional research projects on small business management. They provide information which individuals serving small business can use in working with the owner-manager. Typical titles are "The First Two Years: Problems of Small Firm Growth and Survival" and "Inter-business Financing: Economic Implications for Small Business."

The Management Research Summaries leaflets summarize the findings of reports published under the 1959 and 1960 SBA grant research programs. Summaries cover a wide variety of subjects in the broad area of managing, financing, and operating small business enterprises and are of especial interest to consultants and others who advise small business. Some typical titles are "Small Plant Turnover and Failure," "Finding New Products for Small Manufacturers," and "Financing Problems of Small Manufacturers."

SBA Staff Edits Publications

SBA provides editorial services because authors of the material are active specialists in management and not usually professional writers. These services make an author's job easier and help insure high quality.

When an author's manuscript is received by the Education Division of SBA's Office of Management Assistance, it is edited for approach, content, clarity, and factual accuracy.

The edited manuscript is then sent to outside experts in private and public organizations for review. In order to obtain a diversity of viewpoint and experience, there are as many as four reviewers. Often one is a university man, another a business executive, a third may be a professional (lawyer, accountant, management engineer), and a fourth may be a trade association executive or an official in another Federal agency. Reactions from all these people are studied, compared and evaluated.

The SBA's management assistance leaflets are distributed free, new editions being mailed to readers who have requested this service. Copies of leaflets and lists of free or for-sale publications are available also from the SBA Central Office in Washington, D. C., or the nearest SBA Field Office. Management assistance booklets are sold at nominal prices by the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. SBA leaflets and booklets are in the public domain. They carry no copyright; so they may be reproduced by individuals or organizations, which increases their availability to the general public.

All of these management training materials are oriented to providing information which will be applicable and helpful to the manager, whether he is studying alone or participating in a group counseling session. It should also be apparent that the applicability of the material is not usually restricted to small business. This training does help strengthen the management of the suppliers and customers of big business and the public; but it also could be easily applied to developing the management capabilities of the large firm as well. A thorough grounding in the principles emphasized by these training materials provides knowledge which can be applied to the problems of any business.



FROM THE SPEAKERS ROSTRUM

Military Strength Best Deterrent to Aggression

*Address by Hon. Clark M. Clifford,
Secretary of Defense, at the National
Press Club, Washington, D. C., Sept.
5, 1968.*

Last Sunday [September 1] marked the end of my first six months as Secretary of Defense. Accordingly, this is an appropriate occasion on which to review briefly with you some of my principal impressions about this position and some of the major events of my half year in office.

It seems even clearer to me now than it did at my confirmation hearing last January that my primary responsibility as Secretary of Defense is to seek to assure the survival of this nation no matter what the strength of any of its enemies. Others within and without the Government are free to work unqualifiedly for the best of all possible worlds. The Secretary of Defense must make certain that we are prepared for the worst.

I find this responsibility neither uncongenial nor unrewarding. Because, as I see it, an America that is strong militarily is neither a provocateur nor a potential aggressor. Our military security provides instead the best available deterrent to military adventures by those who might otherwise see how far they could go.

That belief underlies the views I expressed in my confirmation hearing on the issue of our position relative to the Soviet Union in the field of strategic nuclear weapons. I indicated my intention to seek diligently to preserve our margin of advantage. The same motivation governed the position of the Defense Department on the efforts of some in Congress to defer or even eliminate the deployment of our Sentinel anti-ballistic missile system (ABM). Recently we

were also faced with a somewhat comparable decision in connection with the testing of our newest developments in the nuclear missile field. This series of tests involves the principle of multiple independent re-entry vehicles (MIRVs). We were extremely gratified by the results of the initial tests of our Minuteman III and Poseidon missiles.

In both these instances, we have proceeded with these new, and admittedly very expensive, weapons developments not with the idea that war is inevitable. Instead we have done so on the basis that a position of substantial strength is essential and is the best position from which we can negotiate agreements that may make the threat of nuclear war increasingly remote.

There have, of course, been those who have disagreed with this approach. For example, in the course of the controversy over Sentinel, there were those in our Congress who insisted—and I am sure that they did so in all sincerity—that our proceeding with this ballistic missile defense would lead to “very dangerous countermeasures by the Soviet Union,” that it would ignite a missile defense race, and that it would “be positively harmful in its effect upon the growing possibility of discussions between the United States and Russia in regard to the limitations of armaments.”

I did not share these fears. We had made it clear that the Sentinel ABM defense was designed primarily against the Chinese threat and could not cope with a massive Soviet attack. Moreover, I felt and continue to feel that, with the Soviet Union having for some time been engaged in the actual deployment of a ballistic missile defense, our decision to go ahead with our own system would both improve the chances of talks and the

negotiating climate should such talks take place. Whatever the thinking of the Soviet leaders may have been, the Senate's rejection of the attempt to cut off construction funds for the Sentinel certainly did not delay the Soviet decision to start talks on strategic weapons. Just four days after the Senate action, we received for the first time acceptance of our long-standing offer to talk with the Soviet Union about curbs on nuclear weapons.

We can continue to hope that, at an appropriate time, these talks can take place. In the meantime, I am confident that our decision to proceed with the very important tests of our MIRV principle does not prejudice the prospect that such talks would be fruitful.

I am also proceeding with another decision. I have today directed that the Sentinel ABM system be exempt from the expenditure reduction program required by Congress for FY 1969. From a financial standpoint, the option to reduce Sentinel expenditures could have been useful. I have determined, however, that in the light of all current developments our prudent course is to press forward as planned with the Sentinel system.

Justice Oliver Wendell Holmes once said, “The life of the law has not been logic: it has been experience.” One's views are probably at least as much the product of experience as they are of logic. And my own deeply held belief in the importance of dealing from strength has not resulted from the past half year alone, but stems also from my experience with the Administration of President Truman in the period following World War II.

Those were the years in which our hopes that the Soviet Union would cooperate out of good will and common aims in a world of free nations turned out rapidly to be pure illusion.

We found that the dismantling of our military machine was matched by no comparable action on the part of the Soviets. Instead, they exhibited their intention to move in whenever and wherever situations of weakness could be found. We rapidly learned that we could meet this challenge only through such creative actions as the Truman Doctrine, under which we helped provide Greece and Turkey with the means to resist the pressures of communist expansionism. Then there was the Marshall Plan, which enabled the war-drained countries of Western Europe to rebuild their shattered economies. Perhaps most important of all, the North Atlantic Treaty Organization presented the Soviets with an array of free nations firm in their determination to present a collective defense to any further Soviet probes.

My personal participation in the years when NATO was formed unquestionably has influenced my reaction during the past six months to suggestions that the number of American troops in Europe should be drastically reduced. Admittedly the more than 300,000 American servicemen who are now in Western Europe, more than 23 years after the end of World War II, represent a substantial expense for the American people. But the cost is dwarfed when one compares it to the enormous cost of American lives and treasure expended in a general war, or to the consequences if America were to be isolated in a hostile world.

We should not, in my view, be led by NATO's success into the delusion that a strong U. S. military contribution to NATO is no longer necessary. Some had thought, and there had been some signs that justified such thinking, that today's Soviet Union was a far better neighbor than the Soviet Union of the late 1940s.

The events of the past couple of weeks, I submit, have clearly demonstrated that a significant American military presence in Western Europe is still needed. At the same time, our NATO allies surely must review these events from the standpoint of the effect upon our common security.

The developments of these last few days confirm the fact that, when and if we negotiate, safety and success demand that we negotiate from strength.

We would hope at an appropriate time to begin to discuss with the USSR a limitation on both offensive and defensive nuclear weapon systems. Such discussions could lead to an understanding which, at a minimum, would enable us to check the spiralling cost of nuclear arms with no diminution in our national security. The non-nuclear powers, of course, would welcome any evidence of mutual restraint. Such an agreement would also significantly encourage adherence to the Nonproliferation Treaty which both we and the Soviet Union regard as an important safeguard against the nuclear outbreaks that could jeopardize the civilized existence of mankind.

The events that have occurred, and the decisions that I have faced during my half year in office, thus reinforce my fundamental belief that our long-range hopes for peace, and for peaceful co-existence, rest in the continued military strength of the United States.

These months have also seen developments that provide a basis for hope that we can find a solution to our most vexing short-range problem—peace in Vietnam. Contrasting where we were on March 1 with where we are today, there are three important elements in this more hopeful prospect. First and most important was President Johnson's statesmanlike initiative in his March 31 speech, in which he courageously took the first step toward peace by limiting the bombing of North Vietnam to the infiltration routes in the Panhandle. This action led to the Paris peace talks. The talks thus far have pro-

duced no settlement but they are continuing. As Hanoi faces up to the futility of further attempts to take over the South by force, we may see some movement that will bring peace closer.

The second element in the new look since March was the decision that U. S. troop strength in Vietnam could be limited to 549,500. We have been assured by General Abrams, and our commanders in the field told me personally during my July trip to Vietnam, that this strength, together with the forces of the South Vietnamese and our allies, is sufficient to withstand and defeat any offensive that the enemy can mount. Our effort in South Vietnam can now be seen not to be an unlimited drain on our resources. The so-called "bottomless pit" has been capped.

The third and final element in the changed complexion in South Vietnam is the progressive development of our policy to prepare the armed forces of Vietnam to take over a greater share of the burden of the continuing battle if peaceful settlement continues to prove elusive. During the past six months, we have steadily improved the firepower of the Regular Forces and many of the Regional and Popular Forces as well are armed with the M-16 rifle. Our ability to equip all the South Vietnamese combat and combat support troops with this latest and best in shoulder arms is facilitated by the fact that M-16 rifle production is now two and one-half weeks ahead of an already accelerated schedule. Initial deliveries from our two new sources are now expected to arrive more than a month ahead of the scheduled date of February 1969. The armed forces of South Vietnam will continue to receive priority allocation of these weapons. As you know, M-16s are already in the hands of all our American combat troops who are performing so magnificently in Vietnam.

Together, these three developments have put us in a far stronger position to bring our Vietnamese involvement to a satisfactory conclusion.

Finally, I would like to dwell briefly on the special problem of discharging our fundamental responsibility of ensuring the national security at a time when the military means of doing so have become increasingly expensive and when the competing demands on the budgetary



Hon. Clark M. Clifford

dollar have multiplied. As a result of the Congressional mandate that the 10 percent surtax be accompanied by a \$6 billion reduction in Federal expenditures, we must cut \$3 billion out of our defense expenditures for this fiscal year. Several of the steps in this program, which we refer to as Project 693, have already been announced. Obviously the programs, facilities and units eliminated as a result of the restrictions imposed by Congress have represented some reduction in our military posture. They must not, however, despite the obvious difficulties, involve any dangerous impairment of our overall security, or seriously diminish our ability to meet the international treaty commitments which constitute a vital part of that security.

But the financial stringencies under which we must now operate make it more important than ever that we get the maximum value for every defense dollar that we spend. In this effort, we will be aided greatly by a major expense accounting system which we have now adopted in the Defense Department. We call this new system Project PRIME. With PRIME, the commanding officer and every department head at a base will know the cost of military as well as civilian personnel, and the costs of all kinds of services and supplies that are used on a current basis. With this kind of information available quickly and reliably, the commander will be better able to make wise choices in the use of his limited budget funds. PRIME also includes a uniform set of accounts for classifying costs, so that managers at all levels in the department can make useful comparisons. This uniform set of accounts will also help me and others who make choices between major programs, because we can be more confident about the relevant cost of competing programs. PRIME is a significant step in applying businesslike methods to the operation of the Defense Department.

We live in an imperfect world. From the standpoint of our national security, we know not what lies ahead of us next week, next month, or next year. I say to you that our hopes for the future, as well as the lessons of the past, suggest that the rock of power must be the foundation for the house of peace.

Space Beyond the Threshold

Address by Lt. Gen. Joseph R. Holzapple, USAF, Dep. Chief of Staff for Research and Development, U.S. Air Force, at the Second National Conference on Space Maintenance and Extravehicular Activities, Las Vegas, Nev., Aug. 6, 1968.

It is, indeed, a great pleasure to keynote the Second National Conference on Space Maintenance and Extravehicular Activities. This conference can serve the continual needs for fresh perspectives and for cross-stimulation so basic to scientific and technical progress. And there can be no question that the conference co-sponsors—the National Aeronautics and Space Administration and the Air Force Aero Propulsion Laboratory—have developed a program that will well serve those needs.

I think all of us tend to get wrapped up in the hurly-burly of everyday problems. So, from time to time, we simply reach the point where we need briefly to stand aside and take a fresh look, and do some fresh thinking.

I suppose that, over the next several days, someone will inevitably observe that mankind is really only at the threshold of space. I might be tempted to be the first to make this observation. The trouble is I am not at all sure it is true.

I am not sure it is true because I am not sure what it means. If what we really have in mind is the state of our space technologies, then I think that we are already well beyond the threshold. But if we have in mind attitudes toward space, then I think it is entirely possible that we are just barely approaching the threshold.

On the surface, this may appear to be an abstract distinction. Yet it bears vitally on a concern we must all share this morning. Our concern cannot simply be with current technical problems or even with present funding problems. Our inevitable concern must always be with the direction of the national space program over the longer view. I frankly think we cannot long proceed intelligently in space if attitudes lag technologies. So now is the time to take a hard look at some key attitudes toward space.

Thus far, the national space pro-

gram has been propelled largely by the momentum of that mass of technology set in motion by the urgent needs for the ballistic missile, and has been speeded by such stimuli as Sputnik. These have been the exciting early years, rich in the drama of suspense and adventure. These have been the threshold years of space technology—the glamor years of public enthusiasm and public funding.

In the short span of 10 years, this momentum has carried us from those first tentative unmanned space launches to the point where we are already deeply concerned about the direction of our space program beyond the first manned lunar landing.

This is how far the initial momentum has carried us and, of course, we have learned much. But this kind of momentum could not forever continue. We have now well passed that phase in the space program—common to any wholly new scientific endeavor—where technical possibility is its own best justification.

It is, of course, still true for space, as for most areas of technical challenge, that many of the more exciting technical possibilities for the future will stem from insights and discoveries we cannot now even imagine.

But it is true, also, that the scientific search for new possibilities can only be sustained for a limited time, if there is not at least an equally determined search for beneficial applications. The search for applications demands that you lead your technologies, as opposed simply to following them.

The idea of funneling scientific and technical effort into specific applications is not always greeted with marked enthusiasm. In fact, the idea runs counter to a strongly held attitude, especially where space is concerned. This is the feeling that there is the risk of missing unsuspected possibilities if there is heavy concentration on those technologies that already have well defined applications.

Thus, there is a tendency to overlook that fact that the process of leading technologies toward specific applications may, itself, have the effect of opening up new possibilities. Strong direction need not necessarily inhibit scientific and technical innova-

tion. This attitude also tends to forget the fact that our scientific and technical programs in space are not being conducted for their own sake. The ultimate function is to solve problems, or to meet urgent needs, or to open new vistas for human benefit. This is precisely the function of such programs as Apollo Applications and the Manned Orbiting Laboratory. With these programs we are moving somewhat away from basic experimentation and more in the direction of uses and applications in space.

We can all welcome this as a very healthy trend. It is entirely probable that some of the funding problems for some of our space programs will be bridged when the applications are more fully recognized and understood. Very much contrary to another popular attitude—that Vietnam is the source of most of our funding problems—I think the more significant source is the need for a better understanding of possible applications in space, and their true benefits.

I might add, parenthetically, that almost everyone in Government who is confronted with funding problems—and there are few who are not—is likely to point to Vietnam as the source of his difficulty. There is no denying that Vietnam is having some impact. However, I suspect that anyone who is expecting a sudden flow of funds into his particular program the moment the war ends, is liable to be disappointed. In any event, this is almost certain to be true where space is concerned.

Where funding is involved, there can be no doubt that the space program is well beyond the threshold. It is not really that the sense of urgency has gone out of the space program, or even that it has lost much of its romance. The problem, if it can properly be called a problem, is that our nation is tackling a wide range of urgent and demanding challenges. What has happened is that the space program has simply reached a new maturity, and is finding its proper place in the perspective of all of our national challenges. This should not be alarming. The fact that the space program will have to compete even more vigorously with other demands on our national resources may, in the long view, greatly benefit it. This kind of discipline forces even more advanced and creative thinking.

In relation to the somewhat more competitive environment in which the

space program will likely function for funding, there seems to be some renewed concern that the economic factor will place too many space programs at an unfair disadvantage. The feeling may be that innovations in space are anyone's guess and that if they can't be predicted, then neither can their costs. Costs, of course, have to be based on the proven or tested. There is no way to predict costs on the more "high risk" technology programs, where technical problems and system capabilities may be largely unknown. So the effect could be to reduce or eliminate risk taking and this may, in turn, close the door on truly dramatic but unrecognized possibilities.

There is no denying that this is a problem.

However, I think the problem is easily exaggerated. Moreover, experience has shown that the place to explore risks is at the basic technology level. Promising possibilities surface here, and this is where "risk capital" is invested with a view toward eliminating the risks as fully as possible. Generally, the need to take severe risks is eliminated by the time a major hardware program is initiated.

Space Effort Benefits Economy

As for space competing for funding on the basis of economic benefit, there is every reason why it should compete very successfully. There is ample evidence that space applications will shortly, if they have not already, provide economic returns that can match, or perhaps exceed by as much as two to three times, the annual national investment in space, both public and private. This does not take into account the economic return to the nation of such factors as new space-oriented industries. Interestingly, very few people were seriously thinking in terms of space providing an economic return until very recently.

Precise figures are still largely lacking. Nonetheless, the evidence is clear. For example, a study conducted for the National Academy of Sciences pointed to the very high value of meteorological data from the Nimbus and Tiros satellites, and the newer ATS satellites of the Department of Commerce. These data have encour-

aged the development of mathematical models to simulate atmospheric systems on a global scale. The study indicates that weather and atmospheric data, relayed instantly to computers programmed on mathematical models, could make possible accurate weather forecasts for periods of up to 10 days, and perhaps more. It is estimated that the value of such very long-range forecasts to agriculture and the construction industry, alone, could be in the range of about \$800 million a year. It is not difficult at all to visualize the dramatic value that could accrue in such areas as geological survey, aviation, and shipping. As a matter of fact, I can see some real possibilities there for the entire vacation and resort industries, for that matter.

Weather observation is just one significant economic benefit. Communications is another. There is no question that the cost of new satellite communication systems compares much more than favorably with the costs of new trans-oceanic undersea cables, or cross-continent underground and suspended cable system. I understand that AT&T is currently estimating that a combined, space-based telephone-television system, just for the domestic needs of the United States, would result in an investment savings of about \$200 million by 1980.

So any argument that the space program cannot compete on economic grounds is apt to prove woefully shortsighted. In fact, it seems to me that one of the strongest cases for support of the space program in the coming years is going to be the economic case. Like aviation starting in the late 1920s, space in the mid-1960s



Lt. Gen. Joseph R. Holzapple, USAF

promises to open a vast new arena for economic growth. This translates in terms of new jobs, new challenges, and new possibilities.

Realistic Cost Estimates Needed

There is, of course, another aspect of the economics of space. Until rather recently, all of our space programs advanced in a comparatively uninhibited cost environment. This is not to say that no one was thinking about costs, or worrying about them, or attempting to hold them down. On the contrary, this has been a continuing and critical concern. The problem was that we had almost no technical alternatives and even less experience. If we wanted to get into space at all—if we wanted to develop a learning curve—then we had little choice other than to proceed the way we did. From the technical standpoint, the risks really were not all that great. But we knew little about how to predict some of the costs.

Today we have a solid learning curve. We know a great deal more about how to predict costs, and we also know a number of ways by which we can cut or eliminate certain costs. Consequently, we are at the point where it is realistic to demand that every program be fully justified in terms of benefit in relation to cost. In preparing proposals and in advocating systems for space, we can address the subject of costs with far greater confidence. This is to our advantage.

Moreover, NASA and the Air Force can now move even more in the direction of commonality and of multi-purpose designs with the aim of reducing costs. Not that this is entirely new: The man-rating of the Air Force Titan II for use with the NASA Gemini is a case in point. Similarly, Gemini is a vital element of the Air Force Manned Orbiting Laboratory (MOL).

However, the trend will be even more pronounced. At the present time, in fact, NASA and the DOD are jointly studying possibilities for joint use of manned and unmanned space systems. One possibility, perhaps, might be a multipurpose spacecraft suitable for support of the missions and programs of both NASA

and the Air Force. Such dual mission systems, if feasible and effective in terms of the needs of NASA and the Air Force, would result in substantial savings.

Looking a bit further ahead, a very large payload space system might serve specialized missions with highly specialized instrumentation, a ferry run to place support systems in orbit for a future mission, and a resupply mission all on the same launch.

As you know, both NASA and the Air Force are especially interested in the re-use of recovered spacecraft. We have already had some success in this area on a small scale. You may know, for example, that a recovered Gemini has been used in testing a heat shield for the MOL program. But on a much larger scale, our preliminary studies indicate that there could be very substantial savings in the reuse of entire spacecraft, even though the initial costs may be higher.

We are really just getting into the potential economics of re-usable systems. We have been considering various propulsion modes for re-usable boost systems for several years. Much of this is vital conceptual and theoretical work.

The whole matter of re-entry and landing has been of considerable interest. Current recovery techniques, involving direct impact either on water or on land, appear to involve too many shocks that cannot easily be eliminated. Moreover, air recovery by parachute appears to be limited by weight considerations, at least for the near future. So we are keenly interested in large payload boost systems and spacecraft that would have the capability of landing in much the same way as a conventional aircraft.

In line with this, NASA and the Air Force have been conducting joint lifting body tests, principally using the X-24A. The results have been encouraging, but there are still problems. Frankly, the idea of a night or weather approach at 250 knots in an X-24, which has no go-around capability, does not send me to the locker room for my flight suit. What we will want in the actual operational space system is the capacity for conventional landing, combined with the ability to go-around or remain in a holding pattern.

The message in all of this is that economies for space systems are not only possible but technically desir-

able. Those who still hold to the view that you cannot do anything in space without virtually unlimited funds need to adjust their thinking. We can do a great deal in space very economically. And we are going to do just that.

Man's Role in Space

We come, now, to one of the thorniest problems of all. This is the attitude that unmanned near-earth-orbit space systems may have a role, but that man in space has no role. I will not, here, recount the many familiar arguments in support of our manned space programs. This touches on a subject closest to you because you, better than most, know how crucial man is for space maintenance, and what some of his potential extravehicular roles are.

In view of the broad range of space possibilities and the limited degree to which they have yet been explored, the question we should logically ask is simply under what circumstances can man do a better job, how much better, and at what additional cost. This is a key question, and one we must answer in the crucial post manned lunar landing decade.

We cannot ignore man in space and still remain technically competitive in space. However, this is not the only compelling reason to consider man's role in space.

There is the matter of national security. I think there is no nation in the world more intent than ours on wholly peaceful space uses. This deep intent must not lead to the fallacy of ignoring one hard fact: There are potential military applications for space. This is not to say that we need, therefore, deploy hostile space systems. It is simply to say that we should identify the potential threats, and be able to counter them if need be.

In this connection, at the present time, one of the most urgent needs is to quantify military man's role in space. I think that more people need to understand that all of our military programs in space, manned or unmanned, have this basic objective: to make any hostile military applications entirely unattractive as a military expedient. More people think through the attitude military study of possible

applications in space will necessarily invite hostile military applications. The effect is much more likely to be precisely the contrary.

I have talked about some of the current attitudes toward space, and of my own views in their connection. There are, of course, other attitudes that I have not addressed at all. Some of them may be obvious.

I have not, for example, discussed the often expressed feeling that space is essentially the arena of the large corporation and of the large design team. This is a classic misconception. We look back, now, on such "little" problems as eye irritation, the crying need for handholds, and unexpected profuse perspiration during some of the earlier Gemini extra-vehicular activity missions. We know that the answers to these kinds of problems are most likely to come from the smaller companies, or from a single engineer or scientist.

So no one has an exclusive claim on space. Space is a truly national challenge. We have essentially mastered the technology of space access and have made significant steps toward applications in space.

But the real path through and beyond the threshold of space is not the path of technology itself, but of human daring—of our ability to look well ahead of current technologies, and of current applications, for truly dramatic advances and benefits.

The challenge of space cries out not just for huge, talented, and well managed design teams, as important as these are. It cries out even more for the imaginative and the creative who are not inhibited by the past or intimidated by the future, who are prepared to think unconventionally and positively, and, above all, who are prepared to help drive the space program toward a future we cannot now even foresee.

Ogden AMA To Support Maverick Program

Logistic support of the Maverick missile has been assigned to Air Force Logistics Command's Ogden Air Materiel Area, Hill AFB, Utah. Development of the new missile is under the management of Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio. Hughes Aircraft of Culver City, Calif., is the development contractor.

About People

(Continued from page 20)

Air Force Systems Command.

Brig. Gen. William S. Chairsell, Asst. Dep. Chief of Staff (Systems), AFSC Hq., Andrews AFB, Md.

Col. William K. Bailey, Dir. of Production, Air Force Contract Management Div., Los Angeles, Calif.

Col. George T. Galt, Dir., Aerospace Instrumentation, Electronic Systems Div., L. G. Hanscom Field, Mass.

Col. Robert J. Kuehn, Dep. for Communications Systems, Electronic Systems Div., L. G. Hanscom Field,

Col. Joseph H. Myers, Dir., Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio.

Col. Frederick C. Newton, Dir., Procurement and Production Office, Electronic Systems Div., L. G. Hanscom Field, Mass.

Col. Charles H. Peterson, Chief, F-5 and T-38 Systems Program Office, Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

Col. James W. Rawers, Dir. of Information, AFSC Hq., Andrews AFB, Md.

Col. Kendall Russell, Program Dir., Airborne Warning and Control System, Electronic Systems Div., L. G. Hanscom Field, Mass.

Col. Paul M. Spurrier, Dep. System Program Dir., C-5A Program, Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

Col. Roy H. Worthington, Dir., Space and Ballistic Programs, Office of Dep. Chief of Staff (Systems Development), AFSC Hq., Andrews AFB, Md.

Air Force Logistics Command.

Col. Virgil H. Rizer, Chief, Aircraft/Engine Procurement Div., Oklahoma City Air Materiel Area, Tinker AFB Okla.

Office of Aerospace Research.

Col. Dale J. Flinders, Commander, Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. Mass.

Col. William K. Moran Jr., Vice Commander, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio.

Army Seeks Ideas for POW Identification Device

The Army is looking for ideas for a POW identification device that will prevent captured enemy troops or suspected partisans from switching names to confuse interrogation and confinement officials.

High priority is being placed on development of a band that will clearly show when it has been removed or altered.

In addition to preventing POWs from concealing or falsifying their identities, the band and banding devices may have secondary uses in assuring identification of casualties, stragglers, internees and, in some operations, entire populations of towns.

The equipment should not take more than 45 seconds per band to attach and require no new skills. It should not be applicable for use by prisoners as a weapon, signalling device, or hiding place.

Tropic tests are now being performed for the Army's Combat Developments Command, Fort Belvoir, Va., to determine which concept meets the essential and desirable characteristics for wristbands and tamper-proof attachments.

Nike-X Development Office Established at Redstone Arsenal

The Army has established a Nike-X Development Office (NXDO) at Redstone Arsenal, Ala., to insure the adaptability of the Sentinel Ballistic Missile System to changing threats.

The new research agency will be organized into five divisions. Technical areas to be studied by the office include radar development, systems requirement and threat, missile development, reentry physics and range measurement research, and optical systems development.

Julian Davidson, a civilian scientist and former head of the Nike-X Development Group, will head NXDO.

NXDO is a field agency of the Army Advanced Ballistic Missile Defense Agency, headquartered in Washington, D.C. It will be co-located at Redstone Arsenal with the Sentinel System Command to insure maximum exchange of information between the two development efforts.

Guidelines for Developing and Submitting Unsolicited Proposals

The unsolicited research proposal is a document initiated and submitted by a prospective contractor to one of the agencies of the Navy Department with the objective of obtaining a contract to perform basic research, applied research, or exploratory development.

Unsolicited proposals are usually the result of a decision by a prospective contractor that he has conceived something new or novel and that, if sponsored, he can demonstrate that the idea has both scientific merit and a naval application.

In general, such proposals fall into one of three categories:

- Basic research proposals to perform work which will contribute a fundamental knowledge in a scientific area.
- Applied research proposals to use existing scientific knowledge to provide a new naval capability or substantially improve an existing capability.
- Exploratory development proposals to undertake investigations and studies to demonstrate new techniques in naval functional areas or feasibility of a system, subsystem, or component.

The Pre-Proposal Stage

Before any kind of a proposal document is prepared, consideration should be given to what might be called the "pre-proposal" stage to avoid unnecessary spending. Since at this stage there is no certainty that financial support is forthcoming, it is wise that preparatory work be limited to the essential elements of the proposal required to get the idea across clearly and concisely.

The potential contractor should first sort out the obvious technical barriers in his proposal and try to acquire sufficient technical data to indicate that the problems are soluble.

Occasionally, a present contractor may propose research conceived in-

dependently of a currently held government contract, but which has not actually been developed and tested. In such cases, consideration should be given to the rights to the invention which the Government will acquire if the invention is built and tested under the contract. At the least, the contract will require the grant to the Government of a royalty free license to use the invention for governmental purposes. In some circumstances greater rights, including in some cases the grant of outright ownership, may be required.

After the prospective contractor has assembled enough information to adequately describe a new or novel concept, to indicate the approach necessary to solve the obvious technical problems and, if possible, to describe the ultimate military applications, he is ready to prepare a preliminary proposal.

The preliminary proposal should, in general, follow the format described in Figure 1, with the exception that at this stage detailed information is not necessary for sections f, g, and h. The same format will be used for the submission of the finalized unsolicited proposal but with more detail, particularly in the last three sections.

The Submission Stage

The next step in processing a preliminary proposal is to determine the agency, and individuals in that agency, having an interest in the proposal.

The Navy has published two pamphlets which will be useful in establishing contact with the office of primary concern regarding various proposals.

The Office of Naval Research has prepared a publication titled, "The Office of Naval Research Contract Research Program," which gives a general outline of the many scientific disciplines of interest to the Navy. The booklet also contains addresses and telephone numbers of the field organizations of the Office of Naval Research. In addition, the publication contains the telephone numbers of scientists that have cognizance over particular fields of interest. The booklet may be obtained, upon request, from the Office of Naval Research, Code 622, Room 4128, Main Navy Building, 18th St. and Constitution Ave., N.W., Washington, D.C. 20360.

The second Navy publication of interest is titled, "Navy Small Business and Economic Utilization Personnel Directory," (NAVSO P-

Format for Submitting Unsolicited Proposals

- a. One-page summary statement of the proposed work.
- b. A definition of the military application or field of interest and some indication of performance increases which might result.
- c. A summary of the state of the art in the area.
- d. A reasonably complete technical description of the proposed work, including a specific work statement and relationship of the proposed work to other work in the same field.
- e. Names and background of principal investigators and associates.
- f. Estimated duration of project and yearly budget including an estimate of cost of capital equipment and expendable supplies.
- g. Facilities required and knowledge of availability.
- h. Other government-sponsored work in the same area being undertaken by the activity.

Figure 1.

2485). It contains the names, addresses and telephone numbers of all Navy small business specialists. These people are familiar with the total Navy picture and may be of assistance in establishing initial contact. The book is available from the Office of Assistant Secretary of the Navy (Installations and Logistics), Room 2049, Main Navy Building, 18th St. and Constitution Ave., N.W., Washington, D.C. 20360.

In the event basic research or development work is not involved in the proposal, there is a publication titled, "Selling to the Military," which lists all of the military establishments that generate requirements of any nature. Copies can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for 30 cents.

The next decision to be made is whether the preliminary proposal should be mailed to a Navy agency or a personal contact made to discuss the document. If it is at all possible, it is more advantageous to make one or more personal contacts to discuss the proposal with interested individuals. The conversation type proposal discussion makes it possible to obtain detailed comments and suggestions which are difficult or impossible to incorporate in correspondence.

Don't Be Discouraged

One source of discouragement to the prospective contractor is the referral from one office to another in the search for the office or individual who is interested in the area covered by a proposal. This is often referred to as the "bureaucratic runaround" by individuals who don't understand the problem. The Navy and the other Military Departments are large, complex organizations consisting of central and field activities with various responsibilities and interests. It's often a chore, even for experienced employees, to locate an office or individual in a particular department, with a specific responsibility. The prospective contractor should accept the fact that, in many cases, it will require some effort to locate the office or individual who is in a position to evaluate his preliminary proposal.

In any review of a preliminary proposal, either by correspondence or office discussion, the prospective contractor should carefully note any specific technical objections or refer-

ence to lack of military application. It is usually pointless to prepare a final proposal if it does not contain sufficient information to contradict to some degree those objections. Preliminary discussions often reveal information which may make it advantageous for the prospective contractor to slightly alter his original concept, so that his work will more nearly conform to a military requirement of which he was originally unaware.

The Re-evaluation Stage

After the preliminary proposal has been thoroughly reviewed the prospective contractor must evaluate the results of this review to determine if he should submit a formal proposal. Many important questions must now be answered. Was there sufficient interest to justify the expense of a formal proposal? If the reviewing office indicated an interest, was there any reason to suppose that funds were available to support such an effort? Did the reviewing office suggest that the submission be delayed until the next fiscal year when funds will be available? If the concept has a military application, should it be submitted to the Navy Department or some other Military Department?

The Formal Proposal Stage

If the prospective contractor has decided to submit a formal proposal, it is often satisfactory to use the preliminary proposal as the basic structure embellished with additional details. Excellent features of an unsolicited proposal may receive little attention, if the technical information and format are not adequate to convince the prospective customer that the proposal is worthy of acceptance.

One of the factors which influence the acceptance of a proposal is the arrangement of technical groups within a research organization. Scientific disciplines are well defined, and an unsolicited proposal for basic research in a scientific area is usually reviewed by an investigator who is trained in the related discipline. This arrangement assists in processing basic research proposals. Occasionally interdisciplinary proposals appear, but they are the exception rather than the rule. Organizations which support applied research and exploratory development are not as sharply delineated as the basic research organizations, and it is usually more difficult to find the cognizant group.

In addition, any proposal which has a military application should be based on a careful investigation of the following aspects of the work:

- Is the military application a new one or an improvement of current practice?

- If the military application is a new one, does it appear that the successful completion of the work will provide a technique or equipment which will substantially alter our military capability?

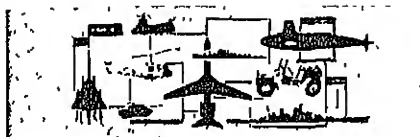
- Is it technically feasible to integrate the new technique or equipment with existing systems?

In other words, the prospective contractor, who investigates the military aspects of a new concept, can often decide for himself whether or not the idea is worth the expense of a formal proposal. Since the military specialist who processes the proposal follows somewhat the same procedure, he is at once impressed with a proposal which shows signs of having been prepared as the result of such an analysis.

Many applied research proposals are technically complicated, and they extend the state of the art to such degree that final answers are available only after meticulous investigation. On the other hand, a first look at some proposals immediately raises some questions which a prospective contractor should have been able to answer by a review of existing knowledge or a simple experiment. Such information voids in a proposal are definitely a handicap to acceptance. It is not contended that the prospective contractor should undertake a research program before he submits a proposal but it is definitely to his advantage to provide enough technical information so the reviewer can reject only on the basis of what is presented.

One item of the formal proposal which should be handled with care is the costs involved. With decreasing military budgets, good technical proposals must be realistically priced or they are of no use to either the prospective contractor or the military.

The successful contractor in the applied research and exploratory development area is the one capable of producing new or novel military applications of research and technical information, and processing the complete technical investigation at a reasonable cost.



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of August 1968.

DEFENSE SUPPLY AGENCY

- 1—E. I. Dupont De Nemours & Co., Wilmington, Del. \$2,683,018. 56,708,000 lbs. of ammonium nitrate. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0688.
- Eastman Kodak Co., Rochester, N.Y. \$1,135,660. 20,000 rolls of photographic aerial film. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0667.
- 2—Stauffer Chemical Co., New York, N.Y. \$3,202,066. 97,625 gallons of aircraft engine lubricating oil and 2,717,500 quarts of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-C-0283.
- 5—Delta Petroleum Co., New Orleans, La. \$1,017,573. 2,367,492 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 640-68-D-017.
- 6—Sportswelt Shoe Co., Nashua, N.H. \$2,985,445. 480,000 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0206.
- Uniroyal, Inc., Providence, R.I. \$1,915,625. 3,250 collapsible 500-gallon drums and 1,325 collapsible drums without hardware. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0657.
- Reynolds Metal Co., Richmond, Va. \$1,138,820. 3,672,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0670.
- Aluminum Co. of America, Pittsburgh, Pa. \$3,840,870. 12,430,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-68-C-0674.
- Alcan Metal Powders, Elizabeth, N.J. \$4,206,050. 14,100,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0673.
- 9—Shell Oil Co., New York, N.Y. \$1,568,463. 1,832,020 quarts of aircraft engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-C-0284.
- 13—Sportswelt Shoe Co., Nashua, N.H. \$1,368,730. 200,000 pairs of men's black oxford shoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0253.
- Endicott Johnson Corp., Endicott, N.Y. \$1,285,025. 184,000 pairs of men's black oxford shoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0252.
- International Shoe Co., St. Louis, Mo. \$1,002,236. 150,000 pairs of men's black oxford shoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0251.
- 14—Eastman Kodak Co., Rochester, N.Y. \$1,468,147. 1,625 cases of photo chemical kits; 78,500 rolls of aerial photo film and 33,000 rolls of photo film. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0795.
- 15—Dole Co., San Jose, Calif. \$1,891,747. 303,254 cases of canned pineapple. Defense Personnel Support Center, Philadelphia, Pa. DSA 187-69-C-2018.
- 16—Uniroyal, Inc., Providence, R.I. \$1,915,625. 3,250 collapsible 500-gallon drums and 1,325 collapsible drums without hardware. Defense General Supply Center, Richmond, Va. DSA 400-69-C-0657.
- 26—Statham Garment Corp., Evansville, Ind. \$1,292,826. 188,680 pairs of men's tropical wool trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0296.
- 27—L. D. Lawson & Co., Long Beach, Calif. \$6,353,183. 214,020 cases of ration supplement sundries packs. Defense Personnel Support Center, Philadelphia, Pa. DSA 134-69-C-0150.
- 28—Ellis Hosiery Co., Philadelphia, Pa. \$1,252,377. 2,208,000 pairs of men's socks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0321.
- Cavlier Bag Co., Lumberton, N.C. \$1,529,097. 6,156,000 polypropylene sandbags and 20,950 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1144.
- Pachogue Plymouth Co., Oakbrook, Ill. \$3,945,846. 2,925,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1149.
- Kane Bag Supply Co., Baltimore, Md. \$1,875,000. 5,000,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1145.
- Bemis Co., Minneapolis, Minn. \$4,111,888. 1,400,000 polypropylene sandbags and 12,000,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1148.
- Wertham Bag Co., Nashville, Tenn. \$1,348,200. 4,200,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1146.
- Consolidated Bag Corp., Philadelphia, Pa. \$1,870,050. 360,000 polypropylene sandbags and 5,580,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1139.
- 30—Atlantic Richfield Co., Los Angeles, Calif. \$5,365,088. 33,600,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0911.
- Cities Service Oil Co., New York, N.Y. \$3,916,189. 29,400,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0913.
- Gulf Oil Corp., New York, N.Y. \$3,307,805. 23,913,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0915.
- Humble Oil & Refining Co., Houston, Tex. \$9,281,756. 64,713,800 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0917.
- Mobil Oil Corp., New York, N.Y. \$13,247,716. 92,500,000 gallons of grade 115/145 and 2,442,000 gallons of grade 80/87 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0918.
- Phillips Petroleum Co., Bartlesville, Okla. \$10,709,238. 71,178,270 gallons of grade 115/145 and 65,000 gallons of grade 100/130 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0910.
- Shell Oil Co. \$1,637,035. 9,092,070 gallons of grade 115/145 and 800,000 gallons of grade 100/130 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0920.
- Union Oil Co., Los Angeles, Calif. \$3,224,484. 21,583,000 gallons of grade 115/145 and 10,000 gallons of grade 80/87 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0923.
- Standard Oil Co., Louisville, Ky. \$2,316,701. 16,861,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0921.



DEPARTMENT OF THE ARMY

- 1—Lockheed Aircraft, Burbank, Calif. \$88,850,000. AH-56A aero vehicles and associated equipment. Van Nuys, Calif. and Johnson City, N.Y. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1749.
- Kaiser Jeep Corp., Toledo, Ohio. \$19,113,777. M39 five-ton trucks, South Bend, Ind. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0012.
- Sovereign Construction Co., Fort Lee, N.J. \$15,291,200. Construction of an academic science building, alterations to Thayer Hall, and relocation of Thayer Road at West Point. Engineer Dist., New York, N.Y. DA CA61-89-C-0009.
- Magnavox Co., Fort Wayne, Ind. \$7,907,034. AN/GRC-106 radio sets. Electronics Command, Philadelphia, Pa. DA AB05-67-C-0166.
- Mack Trucks, Allentown, Pa. \$7,057,160. Five-ton truck diesel engines. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0010.
- E. I. Dupont de Nemours & Co., Wilmington, Del. \$1,724,250. TNT. Barksdale, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00085 (A).
- Bell Aerospace Corp., Fort Worth, Tex. \$1,287,218. UH-1 aircraft main rotor hubs. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- 2—Temco, Inc., Nashville, Tenn. \$2,740,077. Metal parts for XM314A2E1 projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0206.
- Global-Flachbach, Oakland, Calif. \$1,557,243. Construction of an impact instruction tower; a range control center; and an armers' dormitory at Eniwetok. Engineer Dist., Honolulu, Hawaii. DA CA83-69-C-0002.
- Chamberlain Mfg. Corp., New Bedford, Mass. \$1,516,932. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0325.
- General Motors, Detroit, Mich. \$1,354,376. Main battle tank design. Warren, Mich. and Cleveland, Ohio. Tank Automotive Command, Warren, Mich. DA 20-113-AMC-08843.
- Robert E. McKee, El Paso, Tex. \$1,081,152. Construction of administrative and storage buildings, a heating plant, and for extension of utilities, roads and walks, at Fort Carson, Colo. Engineer Dist., Omaha, Neb. DA CA45-68-C-0081.
- 5—Bell Aerospace Corp., Fort Worth, Tex. \$1,700,386. Rotary wing blades for UH-1 helicopters. Hurst, Tex.; \$60,767,560. UH-1H helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022. DA AJ01-69-C-0028.
- Essential Construction Co. and Himeout Constructors, Fort Lee, N.J. \$6,387,500. Construction of 200 housing units at the U.S. Military Academy, West Point, N.Y. Engineer Dist., New York, N.Y. DA CA61-69-C-0013.
- G. W. Galloway, Baldwin Park, Calif. \$1,604,740. Containers for the Shillelagh missile. Army Missile Command, Huntsville, Ala. DA AH01-68-C-2087.
- Texas Instruments, Dallas, Tex. \$3,.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting Agency—Contract Number.

- 250,000. Night vision aerial surveillance systems. Mobility Equipment Research & Development Center, Fort Belvoir, Va. DA AK02-68-C-0383.
- 6—Bell Helicopter Co., Fort Worth, Tex. \$2,076,740. Tail boom assemblies for UH-1 helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- Rulon Co., Chicago, Ill. \$4,645,125. Metal parts for M1 delay plungers for M567 fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0387.
- A. O. Smith Corp., Chicago, Ill. \$1,671,929. Metal parts for 750-lb. demolition bombs. Bellmead, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0078.
- General Electric, West Lynn, Mass. \$9,250,973. Engines for AH-56A aero vehicles (combination rotary/fixed-wing aircraft). Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0073.
- 8—Arkansas State Highway Commission, Little Rock, Ark. \$8,483,000. Work on the Arkansas River navigation project. Engineer Dist., Little Rock, Ark. DA CW03-69-C-0008.
- 9—Pace Corp., Memphis, Tenn. \$2,612,540. Surface trip flares. Camden, Ark. Pictinny Arsenal, Dover, N.J. DA AA21-68-C-0407.
- Chamberlain Mfg. Co., New Bedford, Mass. \$2,600,000. Acquisition of production equipment, rehabilitation, plant rearrangement, installation and freight for the production of metal parts for 155mm shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 19-020-ORD-6459 (A).
- Hughes Tool Co., Culver City, Calif. \$1,947,096. Crew armor and component kits for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA 23-204-AMC-03697.
- Varo, Inc., Garland, Tex. \$7,908,000. Image intensifier assemblies for the stailight scope night vision program. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0116.
- United Aircraft, Stratford, Conn. \$2,600,000. CH-54A helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0827.
- 12—Guy H. James Construction Co., Oklahoma City, Okla. \$8,180,108. Construction of a gravity type concrete spillway at Hugo Reservoir, Okla. Engineer Dist., Tulsa, Okla. DA CW66-69-C-0005.
- American Fabricated Products Co., Indianapolis, Ind. \$1,712,659. 81mm mortar fin assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0293.
- Diamond Construction Co., Savannah, Ga. \$1,081,630. Channel improvement on the Cape Fear River near Wilmington, N.C. Engineer Dist., Wilmington, N.C. DA CW64-69-C-0002.
- 14—Computing & Software, Inc., El Paso, Tex. \$1,734,980. Non-personal services for data reduction, computer programming and related maintenance services at Holloman AFB, N.M. White Sands Missile Range, N.M. DA AD07-69-C-0006.
- Aerofect General, Downey, Calif. \$1,260,000. Bomb dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0027.
- Fred A. Arnold, Inc., Los Angeles, Calif. \$1,086,853. Construction of a concrete addition to an existing building for reentry assembly, surveillance and inspection at Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA09-69-C-0024.
- Levinson Steel Co., Pittsburgh, Pa. \$14,500,066. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0023.
- 15—ITT, Erston, Pa. \$7,873,000. Image intensifier assembly, 25mm. Rockvale, Va. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0116.
- Liton Systems, Van Nuys, Calif. \$5,120,862. Data converter, coordinated air defense systems. Salt Lake City, Utah and Van Nuys, Calif. Army Missile Command, Huntsville, Ala. DA AH01-67-C-1988.
- Philco-Ford Corp., Newport Beach, Calif. \$4,860,625. Guidance and control equipment for Shilleagh guided missiles. Army Missile Command, Huntsville, Ala. DA AH01-67-C-0002.
- Honeywell, Inc., Hopkins, Minn. \$1,283,131. Special assembly machines to meet requirements for the M551 and M538 fuzes for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-022-ORD-2895.
- Teledyne Systems, Northridge, Calif. \$3,000,000. Central computer complex components and associated equipment for use in Cheyenne AH-56A helicopters. Army Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0266.
- Union Carbide Corp., New York, N.Y. \$1,239,504. Dry batteries and ancillary items. Cleveland, Ohio. Electronics Command, Philadelphia, Pa. DA AB05-69-C-3024.
- 16—Sperry Rand Corp., New York, N.Y. \$48,077,106. Manufacture of major caliber ammunition items and components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00080 (A).
- General Electric, Portland, Ore. \$10,849,000. Generators. Engineer Dist., Portland, Ore. DA CW67-69-C-0023.
- Peter Kiewit Sons Co., Vancouver, Wash. \$1,590,364. Grading and embankment protection work for the Lower Granite Lock and Dam. Lewiston, Idaho. Engineer Dist., Walla Walla, Wash. DA CW68-69-C-0018.
- AVCO Corp., Stratford, Conn. \$2,798,986. Turbine rotor blades. Aviation Materiel Command, St. Louis, Mo. AF-41-008-67-A-3634.
- Continental Motors, Mobile, Ala. \$1,289,431. Remanufacture and retrofit of A01895-3 engine to A0S1805-5 configuration for the M42 vehicle. Tank Automotive Command, Warren, Mich. DA AE07-67-C-4000.
- 19—Hamilton Watch Co., Lancaster, Pa. \$2,800,000. 650,000 rear fitting and safety devices for the artillery proximity fuze. Harry Diamond Laboratories, Washington, D.C. DA AG39-68-C-0080.
- 20—Atlas Chemical Industries, Wilmington, Del. \$12,040,541. Production of TNT. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00531 (A).
- Donovan Construction Co., New Brighton, Minn. \$11,264,750. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0036.
- Magnavox Co., Urbana, Ill. \$4,066,200. M18 gun direction computers. Army Procurement Agency, Chicago, Ill. DA AA25-68-C-0420.
- Farmer's Chemical Corp., Tyner, Tenn. \$2,861,700. Production of mixed acids. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00300 (A).
- 21—American Machine & Foundry Co., Brooklyn, N.Y. \$30,253,380. Metal parts for 750-lb bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0036.
- General Motors, Detroit, Mich. \$9,791,040. 81mm cartridge projectiles. Warren and Saginaw, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0281.
- Bell Helicopter, Fort Worth, Tex. \$5,700,000. Maintenance repair parts and special support equipment for the OH-58A helicopter. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0118.
- Godyear Tire & Rubber Co., Akron, Ohio. \$4,064,860. Rubber track shoe assembly for the M60 tank. St. Mary's, Ohio. Tank Automotive Command, Warren, Mich. DA AF07-69-C-0087.
- Neitronics, Needham Heights, Mass. \$1,838,592. 81mm mortar fin assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0251.
- Main Cornice Works, Inc., Beverly Hills, Calif. \$1,026,960. Construction of 90 family housing units at the Naval Postgraduate School, Monterey, Calif. Engineer Dist., Sacramento, Calif.
- 22—Honeywell, Inc., Hopkins, Minn. \$3,238,408. Facilities to meet current requirements for artillery proximity fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-022-ORD-2895.
- 23—Olin Mathieson Chemical Corp., New York, N.Y. \$116,787,500. Production of propellants and ammunition components. Charleston, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00007 (A).
- Campbell Co., Tyler, Tex. \$10,825,000. Construction of a 455-bed hospital. Fort Jackson, S.C. Engineer Dist., Savannah, Ga. DA CA69-69-C-0007.
- Whirlpool Corp., Evansville, Ind. \$3,487,806. 105mm anti-personnel projectiles. DA AA21-69-C-0098; \$1,860,368. Metal parts for 152mm canisters. DA AA21-69-C-0094; \$1,043,008. 105mm projectiles. DA AA21-69-C-0092; \$3,801,924. 90mm projectiles. DA AA21-69-C-0090. Pictinny Arsenal, Dover, N.J.
- Bulova Watch Co., Providence, R.I. \$2,484,600. Head assemblies for fuzes for 80mm mortar projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0077.
- Fairchild Space & Defense Systems, Copague, N.Y. \$3,092,800. Fuzes for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0082.
- La Pointe Industries, Tolland, Conn. \$1,897,570. Fixed-base mounted antennae. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0009.
- 26—National Gypsum Co., Buffalo, N.Y. \$30,827,000. Production of 105mm ammunition items. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00095 (A).
- Atlantic & Gulf Stevedores, Baltimore, Md. \$7,242,544. Stevedoring and related terminal services, for period Sept. 8, 1968 through Sept. 2, 1970. Eastern Area, Military Traffic Management & Terminal Service, Brooklyn, N.Y. DA HC21-69-D-0083.
- URS Corp., San Mateo, Calif. \$5,513,005. Advancement of design, development of design, programming and testing of prototype software for the Combat Service Support System. Mobility Equipment Command, Fort Belvoir, Va. DA 02-086-AMC-00530 (Y).
- Zenith Radio Corp., Chicago, Ill. \$2,630,804. Light anti-tank rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0039.
- 27—Hensel Phelps Construction Co., Greeley, Colo. \$1,558,000. Construction of a rifle squad tactical range at Fort Riley, Kan. Engineer Dist., Kansas City, Mo. DA CA41-69-C-0017.
- Main Cornice Work, Beverly Hills, Calif. \$1,055,556. Construction of Navy enlisted men's family housing at Fort Ord, Calif. Engineer Dist., Sacramento, Calif. DA CA06-69-C-0009.
- Day & Zimmermann, Philadelphia, Pa. \$12,132,370. Loading, assembling and packing of miscellaneous ammunition items and components. Texas, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00114 (A).
- Zenith Radio Corp., Chicago, Ill. \$2,977,849. 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0033.
- Holston Defense Corp., Kingsport, Tenn. \$2,407,155. Production of explosives and for support services. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00035 (A).
- Amron, Orlando, Fla. \$1,763,550. Special assembly machines for manufacturing M551 metal fuze parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0045.
- Northrop Corp., Anaheim, Calif. \$3,037,048. 90mm projectiles. DA AA21-69-C-0001; \$1,643,000. 105mm projectiles. DA AA21-69-C-0098; \$1,121,917. 152mm canisters. DA AA21-69-C-0095; \$2,530,836. 105mm projectile metal parts. Pictinny Arsenal, Dover, N.J.
- 28—Glover, Ltd., Honolulu, Hawaii. \$1,595,000. Channel work and construction of a bridge at Kuloou Stream, Oahu, Hawaii. Engineer Dist., Honolulu, Hawaii. DA CW63-69-C-0007.
- Hercules, Inc., Wilmington, Del. \$81,585,496. Manufacture of propellants and explosives, and for support services. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. W-11-173-AMC-00037 (A).
- R. G. LeTourneau, Inc., Longview, Tex. \$24,089,720. 750-lb. bomb metal parts. Longview and Arlington, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0044.
- Unifroyal, Inc., New York, N.Y. \$9,842,037. Manufacture of explosives, loading, assembling and packing ammunition and for support services. Joliet, Ill. Ammunition

- 14—General Electric, West Lynn, Mass. \$3,-200,549. Spare parts for T64-GE12 engines used on CH-53A helicopters. Aviation Supply Office, Philadelphia, Pa. F34601-68-A-211-GBCX.
- 15—Sanders Associates, Nashua, N.H. \$1,-379,184. Research and development on classified electronic equipment. Naval Air Systems Command. N00019-68-C-0621.
- General Electric, West Lynn, Mass. \$3,-022,492. Spare parts for T64-GE12 engines. Aviation Supply Office, Philadelphia, Pa. F34601-68-A-211-GBDD.
- Tedyne Systems Co., Hawthorne, Calif. \$3,967,105. Self contained navigation systems. Naval Air Systems Command. N00019-67-C-0189.
- 16—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$17,900,000. Incremental funding for the EA-6B program. Naval Air Systems Command. N00019-67-C-0078.
- General Precision Systems, Glendale, Calif. \$6,743,188. Production of fire control systems MK 113, MOD 8, and associated equipment. Naval Ordnance Systems Command. N00017-68-C-1220.
- Corbetta Construction Co., Des Plaines, Ill. \$5,955,000. Construction of service school barracks at the Naval Training Center, Great Lakes, Ill. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill. N62465-69-C-0066.
- Hughes Aircraft, Culver City, Calif. \$5,800,000. Phoenix guided missiles. Naval Air Systems Command. N00019-C-0295.
- United Aircraft, Windsor Locks, Conn. \$1,900,000. Propeller systems for the C-130 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-67-A-1901-0677.
- Standard Products Co., Cleveland, Ohio. \$1,107,957. Shudder seal track section kits for the repair and overhaul of amphibious vehicles. Headquarters, Marine Corps. M00150-69-C-0109.
- 19—Marinette Marine Corp., Marinette, Wis. \$4,084,600. Construction of 28 aluminum landing craft, mechanized (LCM). Naval Ship Systems Command. N00024-69-C-0217.
- General Dynamics, Groton, Conn. \$1,-752,921. Nuclear powered attack submarine concept-formulation studies in the areas of ship design, operations analysis, and systems engineering. Naval Ship Systems Command. N00024-69-C-0347.
- 20—Vickers Limited Engineering Group, Newcastle Upon Tyne, England. \$4,400,-102. Production of ASROC launchers and related equipment. Naval Ordnance Systems Command. N00017-69-C-1406.
- 21—General Dynamics, Quincy, Mass. \$3,-946,880. Nuclear propulsion plants. Naval Ship Systems Command. N00024-68-C-5483.
- Fred A. Arnold, Inc., Los Angeles, Calif. \$2,263,000. Construction of 118 family housing units at the Naval Postgraduate School, Monterey, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. N02474-67-B-0768.
- Sanders Associates, Nashua, N.H. \$1,-319,400. ECM equipment. Naval Air Systems Command. N00019-69-C-0050.
- M.O.N.T. Boat Rental Services, Golden Meadow, La. \$1,080,000. Six 100-foot commercial type utility boats. Naval Ship Systems Command. N00024-69-C-0218.
- 22—North American Rockwell Corp., Anaheim, Calif. \$5,700,000. Repair of ships inertial navigation systems (SINS) equipment. Naval Ship Systems Command. N00024-69-C-5033.
- Boland Machine & Mfg. Co., New Orleans, La. \$5,393,944. Activation, repair and conversion of the Marshfield Victory to a fleet ballistic missile resupply cargo ship. Naval Ship Systems Command.
- 23—McDonnell Douglas Corp., St. Louis, Mo. \$20,600,000. Extension of long lead time effort for the FY 1969 F-4 aircraft program. Naval Air Systems Command. N00019-69-C-0171.
- Dillingham Construction Corp., Bonita, Calif. \$2,600,000. Construction of an aircraft hanger at Travis AFB, Calif. Naval Facilities Engineering Command.
- 26—American Mfg. Co. of Tex., Fort Worth, Tex. \$3,525,000. Bomb bodies for 1000-lb. bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0018.
- American Cement Corp., Los Angeles, Calif. \$2,833,660. 94-lb bags of Portland cement. Westmore, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-69-D-0126.
- Metals Engineering Co., Greenville, Tenn. \$1,882,952. Fin assemblies for bombs with suspension lugs and cranes. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0019.
- J.S. Floyd Corp., Norfolk, Va. \$1,784,-727. Rehabilitation of barracks at the Naval Air Station, Oceana, Va. Naval Facilities Engineering Command. 62470-68-C-0062.
- R. D. Lambert & Sons, Chesapeake, Va. \$1,063,000. Construction of an avionics shop at the Naval Air Station, Oceana, Va. Naval Facilities Engineering Command. 62470-68-C-0743.
- 27—U.S. Steel, Pittsburgh, Pa. \$10,771,001. 500-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-3590 P000.
- Burroughs Corp., Phila., Pa. \$6,986,-000. Classified equipment. Naval Ordnance Systems Command. N00017-69-C-1492.
- Sperry Rand Corp., Syosset, N.Y. \$4,-250,000. Technical assistance associated with the Fleet Ballistic Missile Submarine USS James Madison (SSBN-627) Class Overhaul Program. Naval Ship Systems Command. N00024-69-C-5110.
- Kaman Aircraft, Bloomfield, Conn. \$2,-110,348. Modification of UH-2A/B helicopters to a twin engine configuration designated UH-2C. Naval Air Systems Command. N00019-69-C-0066.
- General Electric, West Lynn, Mass. \$22,300,000. Engineering development of the TF-34 turbofan engine for VSX aircraft. Naval Air Systems Command. N00019-68-C-0443.
- Lockheed Aircraft, Burbank, Calif. \$5,-400,000. Contract definition for the VSX weapon system. Naval Air Systems Command. N00019-69-C-0102.
- General Dynamics, San Diego, Calif. \$4,895,000. Contract definition for the VSX weapon system. Naval Air Systems Command. N00019-69-C-0055.
- 28—Kollman Instrument Corp., Syosset, N.Y. \$2,983,004. Reproduction of technical data for ranging, telescopic and other related equipment. Naval Ordnance Systems Command. N00017-69-C-4203.
- General Precision, Inc., Wayne, N.J. \$2,000,000. Advanced guidance system work on Poseidon Strategic Systems Project Office. N00030-69-C-0086.
- Westinghouse Electric, Pittsburgh, Pa. \$3,580,000. Nuclear reactor components. Naval Ship Systems Command. N00024-69-C-5101.
- 29—General Dynamics, Groton, Conn. \$3,-000,000. Advance planning, design, and other work preparatory to the conversion of the Fleet Ballistic Missile submarines USS Casimir Pulaski (SSBN-633) and USS Stonewall Jackson (SSBN-634) to C-3 Poseidon missile capability. Naval Ship Systems Command. N00024-69-C-0214.
- General Electric, Syracuse, N.Y. \$1,-781,278. Field change kits for AN/SPS-30 radar sets. Naval Supply Center, Norfolk, Va. N00180-69-C-0021.
- United Aircraft, East Hartford, Conn. \$1,770,892. Engine spare parts to support J48 and J67 engines for F-9F aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-69-69-000A-AF633.
- Campbell Machine, Inc., San Diego, Calif. \$1,269,396. Construction of two 85-foot light warping tugs. Naval Ship Systems Command. N00024-69-C-0219.
- United Aircraft, East Hartford, Conn. \$1,233,799. Engine spare parts to support J52 and J57 engines for F8, A3, A4 and A6 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-69-69-000A-AF632.
- Sperry Gyroscope Co., Great Neck, N.Y. \$1,400,000. Modernization of the Torrier MK 76 fire control system. Naval Ordnance Systems Command. N00017-67-C-0045.
- 30—Control Data Corp., Minneapolis, Minn. \$5,919,461. Design, development and fabrication of automatic formation drone control system for the Naval Weapons System, China Lake. Navy Purchasing Office, Los Angeles, Calif. N00123-69-C-0082.
- Outboard Marine Corp., Waukegan, Ill. \$1,471,730. Firefighting pumps. Gates-

burg, Ill. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-7157.

- General Precision Systems, Little Falls, N.J. \$1,258,600. An inertial measurement unit for the A-7E aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-3201-0043.



DEPARTMENT OF THE AIR FORCE

- 1—North American Rockwell Corp., Anaheim, Calif. \$48,000,000. Production of Minuteman III guidance and control systems. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0174.
- Westinghouse Electric, Baltimore, Md. \$15,080,316. Replenishment of spare parts of an airborne radar system. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F34601-68-A-6634-OP60.
- Dow Chemical Co., Midland, Mich. \$1,-502,247. Bombs. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69-C-0191.
- Lear Siegler, Inc., Grand Rapids, Mich. \$1,068,388. Airborne navigation components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0861-P00.
- 2—United Aircraft, East Hartford, Conn. \$1,166,808. J57 and J75 aircraft engine spare parts. \$1,008,400. T34 aircraft engine spare parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383-69-000A.
- 6—Hawell Corp., Little Neck, N.Y. \$1,-880,892. Production of receiver transmitter systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0610-P004.
- Kollman Instrument Corp., Syosset, N.Y. \$1,080,000. An illustrated parts break-down for AN/USQ-28 mapping and survey subsystem. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1146.
- Westinghouse Electric, Baltimore, Md. \$2,524,000. Production of electronic warfare equipment for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-0094.
- I.B.M. Corp., Los Angeles, Calif. \$1,-077,635. Depot level maintenance and logistic support of the SAGE computer system for FY 1969. Kingston, N.Y. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04506-68-C-0764.
- 6—Cutlass Wright Corp., Wood-Ridge, N.J. \$1,057,079. Production of blade assemblies for J-65 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-67-A-5000.
- 8—United Aircraft, East Hartford, Conn. \$1,190,201. Nozzles and forgings for J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383-69-000A.
- American Electric, Inc., La Mirada, Calif. \$3,551,088. Bomb production. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F04606-68-A-0164-P001.
- 12—Hughes Aircraft, Fullerton, Calif. \$3,-822,158. Inclusion of automatic data link capability to tactical operations centers. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19623-67-C-0154-P048.
- 13—General Electric Aircraft Engine Group, West Lynn, Mass. \$6,848,400. Production of J85-GE-17A engines in support of A-37B aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-1659-P017.
- Lockheed Aircraft, Marietta, Ga. \$2,-195,409. Production of modification kits for C-141 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-A-0325-0194.

- Sun Electric Corp., Crystal Lake, Ill. \$1,804,521. Hydraulic test stands for F-1 and F-100 aircraft. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-C-9033.
- 14—Aerodex, Inc., Miami, Fla. \$1,037,235. Overhaul of R3350 reciprocating aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D-0645-P034.
- Aerodex, Inc., Miami, Fla. \$1,071,463. Overhaul of R4360 reciprocating aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D-0616-P021.
- Lenkirk Electric Co., San Carlos, Calif. \$1,576,500. Production of communications equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-G-0557.
- Motorola, Inc., Scottsdale, Ariz. \$7,649,474. Bomb fuzes. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0237.
- 15—Sylvania Electric Products, Mountain View, Calif. \$1,320,000. Depot level overhaul manuals. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF33(657)-14055.
- Lenkirk Electric Co., San Carlos, Calif. \$1,514,700. Production of communication multiplex equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-4701.
- General Electric, Burlington, Vt. \$1,200,264. Spare parts for aircraft armament. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-67-A-0344.
- 16—Service Technology Corp., Dallas, Tex. \$11,498,970. Conversion of range telemetry systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F19628-68-C-0195.
- Philco-Ford Corp., Palo Alto, Calif. \$2,000,000. Work on ejection equipment for re-entry vehicles. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-69-C-0110.
- 19—Dynamics Corp. of America, Bridgeport, Conn. \$2,972,937. Production of MB generator sets. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-D-0576.
- Modulux, Inc., Newark, Calif. \$2,642,960. Production of relocatable buildings. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-C-2820-P002.
- AVCO Corp., Richmond, Ind. \$2,000,000. Production of bomb fuse assemblies. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- 20—Batesville Mfg. Co., Camden, Ark. \$2,000,370. Production of aircraft munitions. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0284.
- 21—Batesville Mfg. Co., Batesville, Ark. \$2,520,000. Bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0164.
- Lifton Systems, Van Nuys, Calif. \$1,432,710. Ground radar components. Salt Lake City, Utah. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-A-0103.
- 22—Cessna Aircraft Co., Wichita, Kan. \$3,910,000. Production of A-37 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0079.
- ITT, Nutley, N.J. \$3,240,804. Production of spare parts for a radio navigation system (LORAN-D AN/ARN-92). Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F33657-67-C-0524.
- 23—United Aircraft, Hartford, Conn. \$1,010,782. Production of spare parts for J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383-69-000A.
- Atlantic Research Corp., Costa Mesa, Calif. \$4,765,000. Manufacture and launch of 80 Athena H missiles in support of advanced ballistic reentry systems. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0046.
- 26—LTV Electronics, Salt Lake City, Utah. \$2,612,330. Manufacture of communications test equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
- Boeing Co., Seattle, Wash. \$1,300,000. Engineering support for a missile silo program. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif.
- Overseas National Airways, Jamaica, N.Y. \$10,504,892. Domestic cargo air transportation. Military Airlift Command.
- Universal Airlines, Ypsilanti, Mich. \$5,028,416. Domestic cargo air transportation. Military Airlift Command.
- World Airways, Oakland, Calif. \$2,693,151. Domestic cargo air transportation. Military Airlift Command.
- Saturn Airways, Inc., Oakland, Calif. \$6,127,352. Domestic cargo air transportation. Military Airlift Command.
- Universal Airlines, Ypsilanti, Mich. \$9,913,669. Support of the Navy Quicktrans system. Military Airlift Command.
- 27—McDonnell Douglas Corp., Tulsa, Okla. \$1,080,500. Inspection, repair, and modification of B-66 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0582.
- United Aircraft, West Palm Beach, Fla. \$11,000,000. Initial engineering development for the Air Force FX/Navy VFAX engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. 69-C-0060.
- General Electric, Cincinnati, Ohio. \$11,000,000. Initial engineering development for the Air Force FX/Navy VFAX engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. 69-C-0060.
- 28—ITT-Gillilan, Van Nuys, Calif. \$1,850,000. Radar equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-C-0381.
- Libby Welding Co., Kansas City, Mo. \$2,871,678. Generator sets. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-68-D-0135 (0003).
- Cryogenic Engineering Co., Denver, Colo. \$1,046,680. Liquid oxygen tanks.

- San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D-70094.
- 29—Sanders Associates, Bedford, Mass. \$9,467,324. Production of proximity fuses. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0335.
- General Motors, Indianapolis, Ind. \$4,677,300. Procurement of T-56 turboprop aircraft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0180.
- Kaman Corp., Bloomfield, Conn. \$2,207,068. Replacement spare parts for HH-43 helicopters. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0524.
- 30—Electronic Communications, St. Petersburg, Fla. \$1,050,000. C-135 aircraft communication equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F09603-68-A-0211.
- M.I.T., Cambridge, Mass. \$25,943,000. General research and space communications support. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF19 (628) 5167.
- Holmes & Narver, Inc., Los Angeles, Calif. \$1,687,020. Maintenance and operation equipment for the Point Barrow Navy Research Site, Alaska. Alaskan Air Command. AF65517-69-C-0001.

OFFSHORE PROCUREMENT

- 5—Canadian Commercial Corp., Ottawa, Ontario, Canada. \$3,871,400. Non-personal services, data and logistic support for FY 1969 operation and maintenance of the USAF-Canadian Northeast Wideband Systems and depot level maintenance of Pinetree East electronic and ancillary equipment. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

Proposals Asked for Army Automatic Cannon

The U.S. Army Weapons Command, Rock Island, Ill., has announced that competitive proposals from industry will be open this fall for development of a new automatic cannon.

Nicknamed "Bushmaster," the new weapon will be employed on a new family of Army combat vehicles and will be the successor to some .50 caliber machine guns and the M139 20mm gun.

It is anticipated that successful contractors will be awarded initial contracts in early 1969. Production is scheduled for the mid-1970s.

The Bushmaster system will include the new automatic cannon, ammunition, and feed system. It is expected that the new cannon will be 20mm or larger. The new system will permit the gunner to select the type ammunition which will be most effective against the target.

Lieutenant Colonel Patrick H. Lynch, Project Manager for Vehicle Rapid Fire Weapons Systems, at the Army Materiel Command, is charged with the responsibility for development of the Bushmaster.

Army Opens Research Liaison Offices

The Army Combat Developments Command (CDC) has established a Research and Industry Liaison Office (RILO) at its Fort Belvoir, Va., headquarters, and a branch in the Federal Building, Los Angeles, Calif.

A booklet on its operations is available from RILO, Headquarters, U.S. Army Combat Developments Command, Fort Belvoir, Va. 22060.

Changing Address?

The *Defense Industry Bulletin* converted to a computer-prepared mailing list a few months ago. Now, when requesting a change in address or a deletion, subscribers must send the mailing label from the back cover of the magazine. Without this label, changes in address or deletions cannot be effected. Changes and labels should be sent to the Editor, *Defense Industry Bulletin*, OASD (Public Affairs), Room 1E764, The Pentagon, Washington, D.C. 20301.

OFFICIAL BUSINESS

When requesting address change, include current mailing label, above.

DOD Launches RDT&E Program To Upgrade Military Food Service

A single, coordinated and viable food research, development, test and engineering (RDT&E) program will be formulated and executed by the Defense Department to continually upgrade the general and specialized military feeding programs, and to meet feeding requirements as they change with the changing modes of warfare.

DOD Instruction 3200.10, "Research, Development, Testing and Engineering for the DOD Food Program," dated July 12, 1968, establishes policy and assigns responsibility for the program in DOD. The instruction includes, but is not limited to, the following elements of food service:

- Nutritional requirements and adequacy under all conditions.
- Food chemistry, microbiology, processing, preservation, packaging, stability and consumer acceptance.
- Food preparation, holding, serving and handling equipment.
- Food service systems, materiel and facilities for all environments and all operating conditions.
- Recipes, menus, operational rations, and food packets.
- Specifications data for food and related packaging, equipment and systems.

Under the new instruction, the Director of Defense Research and Engineering (DDR&E) is responsible for supervising and monitoring the food RDT&E program. The Assistant Secretary of Defense (Installations and Logistics) is responsible for insuring that the output of the RDT&E program is properly integrated into the Uniform Food Service Program, and making recommendations for research and development programs.

Responsibility for the formulation of the DOD food RDT&E program, subject to the approval of DDR&E, is assigned to the Secretary of the Army.

The Army will execute the approved program in coordination with the other Military Departments and appropriate DOD components. The individual Services will propose to the Army RDT&E projects for which there are unique requirements for incorporation into the overall DOD program.

New AFSC Center Organized at Eglin AFB, Fla.

A new element of the Air Force Systems Command (AFSC) has been established at Eglin AFB, Fla., called the Armament Development and Test Center (ADTC).

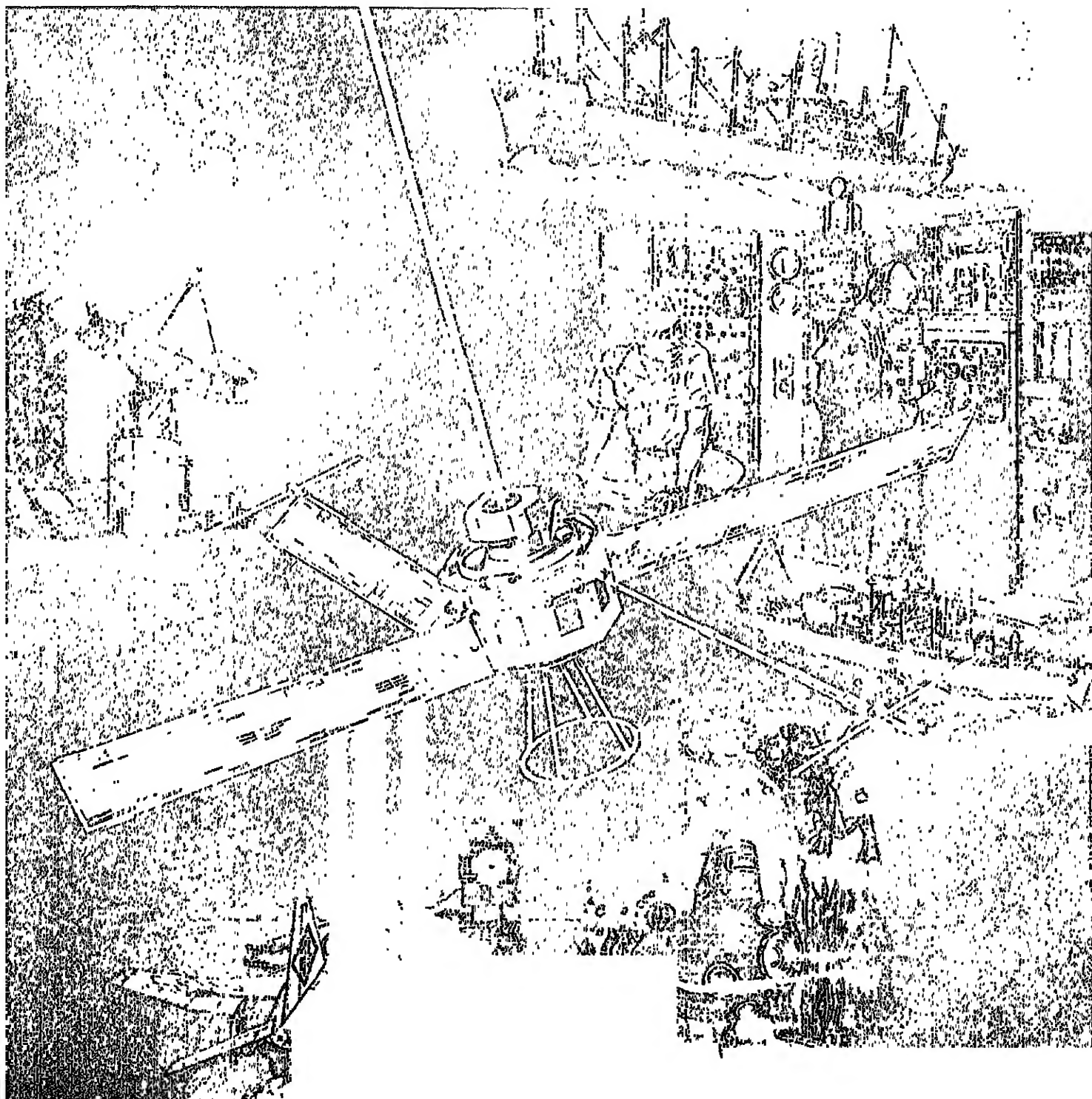
Concurrent with the organization of ADTC, the Air Proving Ground Center (APGC) at Eglin AFB was discontinued. Major General A. J. Kinney, who had commanded APGC, now commands the new center.

ADTC will be responsible for the Air Force non-nuclear munitions program, including initial acquisition, engineering development, test, evaluation and program management.

Major mission elements of the center will be the Directorate of Engineering, the Directorate of Test and Evaluation, and the Directorate of Acquisition. Personnel involved in initial munitions acquisition functions, now assigned to the Aeronautical Systems Division at Wright-Patterson AFB, Ohio, will be transferred to ADTC. The Air Force Armament Laboratory at Eglin will continue to function under AFSC headquarters, but will work closely with ADTC.

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The *Bulletin* serves as a means of communication between the Department of Defense, its authorized agencies, defense contractors and other business interests. It provides guidance to industry concerning official DOD policies, programs and projects and seeks to stimulate thought on the part of the Defense-Industry team in solving problems allied to the defense effort.

Suggestions from industry representatives concerning possible topics for future issues are welcomed and should be forwarded to the Editor at the address shown below.

The *Bulletin* is distributed free of charge to qualified representatives of industry and of the Departments of Defense, Army, Navy, and Air Force. Subscription requests should be submitted on company letterhead stationery, must indicate the position title of the requestor and be addressed to the Editor, Defense Industry Bulletin, OASD (PA), Pentagon, Washington, D. C. 20301.

Contents of this magazine may be freely reprinted. Mention of the source will be appreciated.

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Artist's concept of the many applications of the Navy's Navigation Satellite. Article begins on page 1.

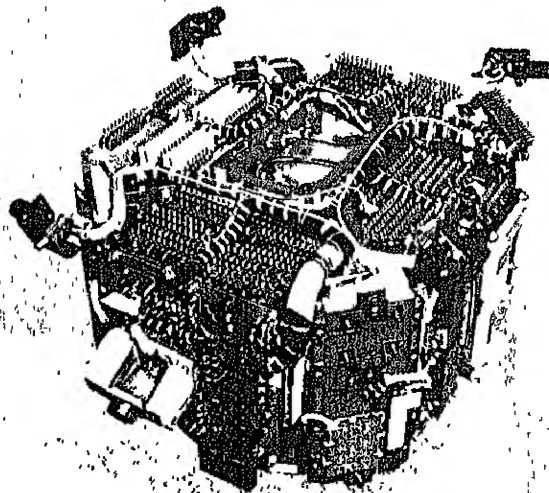
PINPOINT NAVIGATION

...By Satellite



NEW AVENUES FOR INDUSTRIAL EXPANSION ARE REVEALED
BY DISCLOSURE OF THE NAVY'S NAVIGATION SATELLITE SYSTEM

A man-made star races around Earth at five miles a second. Its body is an octagonal drum. Four blades, inlaid with a mosaic of photoelectric cells, gather energy from the sun. A 100-foot ribbon of metal alloy extends upward from its deck to keep a transmitting antenna on its base pointing at Earth, 600 miles below. Its payload, the size of a large hat-box, is crammed full of circuitry, memory banks, oscillators, storage batteries, receiving, transmitting apparatus. Through the modern miracle of microminiaturization, a Navy Navigation Satellite containing 34,000 components weighs less than 130 pounds.



For every pound of satellite in orbit, there are tons of supporting equipment on earth—receiving, computing, timing, telemetry and transmitting gear—all operated by men of the Navy Astronautics Group, who manage this utilitarian family of navigation satellites and keep each one of them supplied with information destined for Navy users around the world. The network command post is located at Point Mugu, Calif., on the grounds of the Pacific Missile Range. Other stations are situated in Maine, Minnesota and Hawaii. They track each passing satellite electronically and relay their observations of its orbital course to a central computer complex at headquarters. Exact predictions where each satellite will be in orbit at two-minute intervals throughout the day ahead are computed from these up-to-date reports; when broadcast from a satellite, they will define its orbital whereabouts as it circles the globe. These predictions are timed to come true the instant they are received on Earth. If you know a satellite's orbit, a measure of the frequency change versus time in signals received from the passing satellite can be used to pinpoint your position on Earth. Any place on Earth revolves within range of a single polar-orbiting satellite at least twice a day. The Earth revolves beneath the plane of such a satellite about 27 degrees of longitude per 108-minute orbit, or approximately the longitudinal difference between Minneapolis and Los Angeles. The system will work with one satellite, but more have been added to meet operating requirements of the Fleet.

Satellites in orbit, network equipment that operates them, navigation sets aboard ships that use them—these are the basic elements of the Navy Navigation Satellite System.

They are also elements of interest to defense contractors who manufacture electrical and electronic equipment. The ground system alone represents an initial investment of \$14.5 million, with an annual upkeep that amounts to \$4 million. The design concept followed from the beginning has been that the system should represent an ingenious association of shelf-items wherever possible, with in-house engineering of special purpose hardware confined to those items for which there is no commercial counterpart. Without compiling an

otherwise useless statistic, it is safe to say that 90 percent of the System is made up of hardware built by defense contractors and over-the-counter items produced by commercial manufacturers.

Add to this the impetus given the electronics industry last year by Vice President Humphrey's disclosure of our government's intent to authorize commercial manufacture of shipboard receiving equipment to utilize information broadcast by the navigation satellites. As Chairman of the National Council for Marine Resources and Engineering Development, he announced that this equipment would be cleared for sale to U.S. civilian shipping. A policy regulating sale of this equipment to our closely allied nations is under consideration.

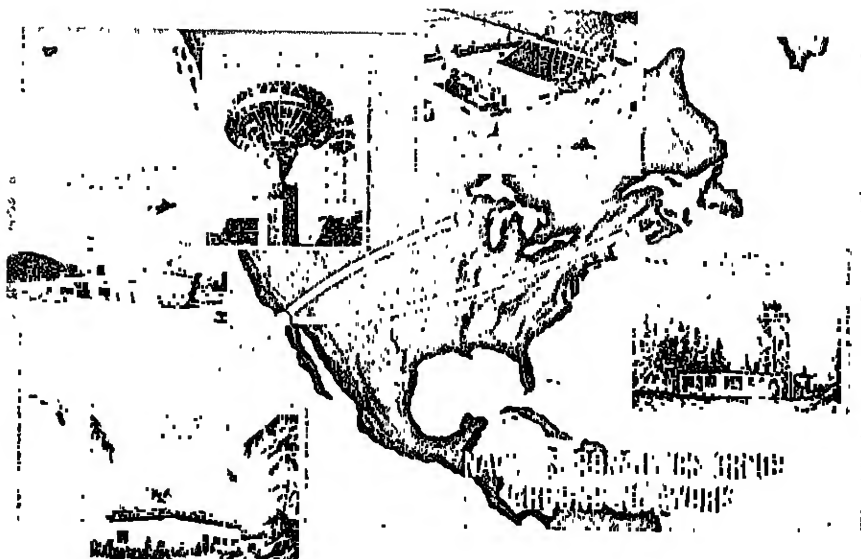
In his announcement, the Vice President cited "an increasing interest in this system by the industrial community, offshore oil exploration companies, and other segments of U.S. industry interested in the commercial applications of this system for ships requiring accurate navigation," as influencing the decision to release for non-military use commercially produced versions of satellite navigation sets in the interests of industrial development.

Vice President Humphrey concluded this announcement of the clearance of the Navy Navigation Satellite System, noting that "The Navy will shortly provide the National Security Industrial Association

with the necessary technical information and documentation concerning shipboard user equipment (the navigation sets) which would be available for use on an equal basis by any interested U.S. party." This has been done.

The immediate and long-range effects of this disclosure upon our industrial economy will be discussed in this article. The flood of inquiries from scientific and industrial research organizations triggered by this announcement indicates that a ready market awaits production of user equipment. Manufacture of commercial receivers is underway at ITT Aerospace and Magnavox Co. We are advised that, eventually, commercially made shipboard receivers will be placed on the market at a price between \$5,000 and \$10,000. Almost any standard computer can be programmed to work with them; ITT will offer a 6 by 6 by 15-inch low-cost computer specifically designed to fit the receiver chassis as an ensemble navigation set.

The navigation satellite continuously broadcasts signals modulated with data letting users know which satellite it is, what time it is according to the satellite "clock," and exactly where in space the satellite is right now. Aboard ship, a navigation set measures the frequency change in incoming signals at the same time that it is receiving and decoding the data broadcasts. It equates the two, to print out an "instant fix."



Although commercially produced shipboard user equipments are bound to differ superficially according to the design of each individual manufacturer, basically each will contain:

- Radio receivers capable of acquiring both signal frequencies generated by navigation satellites.

- Corrective devices that calculate and cancel ionospheric refraction effects (bending that occurs whenever radio signals pass through the surrounding layer of ionosphere enroute to Earth).

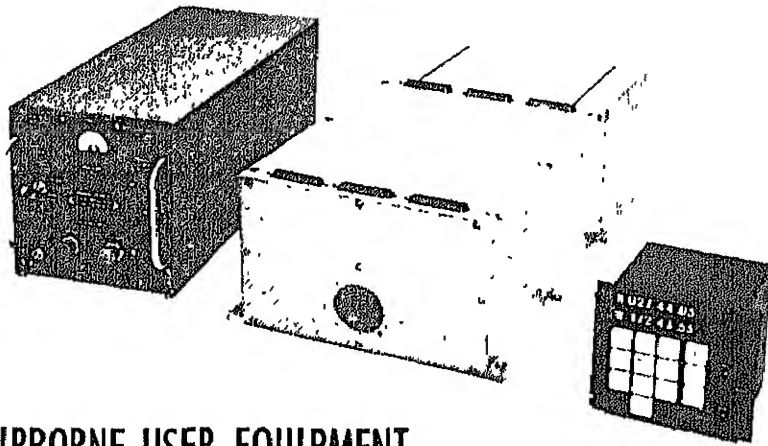
- A cycle-counter and stable time-standard that measure changes in frequency (doppler shift) at precise intervals, typically apparent during reception of signals from a passing satellite.

- Decoding equipment that translates a portion of the navigation data being broadcast from the satellite (superimposed as phase-modulation upon incoming carrier signals).

- A computer that stores incoming doppler count and navigation data, programmed to equate the two and print out latitude, longitude and satellite time.

Navigation by satellite—how does it work? At least three of the two-minute intervals, into which satellite broadcasts are divided, are required by commercial user equipment to calculate a position fix. Orbital parameters broadcast by the satellite, defining that portion of the orbit which corresponds to doppler counts received, are used to compute successive hyperboloids of revolution. The point on Earth, where these hyperbolic cones intersect, is the ship's position.

A ship does not sail its charted course down a line drawn with a ruler, but it does so as closely as possible through dead reckoning. Conventionally, the navigator adds logged speed, compass bearings and educated guesswork about external forces affecting the ship's passage to his most recent celestial observations. Whenever he can, he checks his assumed position by sextant at sunrise, sunset, or high noon, and the ship's heading is altered slightly from day to day to return to its charted course. Weather conditions limit chances to "shoot" the noonday sun or the stars at dawn or dusk, and certain knowledge of the ship's true position is often forced to wait until the next clear day. Night or day, anywhere on



AIRBORNE USER EQUIPMENT

Earth, in any kind of weather, navigation satellite signals are ready to supply a far more accurate fix than can be obtained from celestial observations, even under ideal conditions.

Navigation by satellite does not supplant any of the navigation systems presently in use. It is not a navigation system in the full sense of the word. What it does is provide the most accurate, reliable way yet known to fix your position. It is more properly defined as a positioning system that is readily available as a navigational aid to provide precise reference points required periodically to zero out accumulated errors inherent in any dead reckoning navigation system. It represents a new departure in celestial navigation, using a man-made artificial satellite that takes an active part in the navigation process—a "radio star" which may be observed electronically under any conditions. So far as the user is concerned, this position referencing system is passive, requiring no transmission on his part.

Commercial uses of the system will benefit some industries directly; others will experience long-range expansion from achievement of scientific goals that will open broad fields for industrial development of new processes and products. Industries will be formed that do not exist today.

Some segments of American industry regard the Navy Navigation Satellite System primarily as a navigation aid; other segments are

chiefly interested in it as a positioning system.

For instance, merchant shipping will obviously benefit from its use as a navigation aid, enabling precise position determination under adverse weather conditions.

As an example of its use primarily as a positioning system, the precise reference points contributed by navigation satellites for fixing the location of an oil-drilling site at sea are right down the oil industry's alley. Translocation is a particularly useful technique to establish such an offshore site. This method positions survey ships in relation to a "surveyed-in" shore station—separate receivers are operated aboard ships and ashore, independently and simultaneously in view of a passing satellite. A single computer is maintained at the shore station. This receiver partnership obviates many user error possibilities in the use of satellites for navigation.

Colocation is another useful technique in which a satellite receiver and another navigation receiver, such as Loran or Omega, are physically located in the same place or vessel. By taking simultaneous fixes from each receiver, an error or bias can be determined. Because the bias remains essentially constant between satellite passes, an economical high accuracy continuous navigation system is available using the colocation technique.

"Navigation-after-the-fact" is an interesting development along these lines as, for instance, when a receiver is activated aboard an oil-exploration

ship to keep a mnemonic log of its travels, leaving it free to go about its business of collecting core samples without having to anchor to take a celestial fix whenever a sample is brought up. Each sample is labeled chronologically. Later, when the ship returns to base, the position at which each sampling was taken can be reconstructed from the ship's recorded satellite receptions by the shore computer, which has been operating closely enough to register the same broadcasts at the same times. In this instance, error factors due to ionospheric refraction are canceled since both receivers are affected equally. Makers of commercial satellite receiver sets are carrying as many back orders on their books today from major oil companies as from scientific research organizations.

This new position fixing technique has a practical counterpart usage in industrial exploration on land as well. Prospectors will be able to carry satellite receiving equipment into the back country. It will no longer be necessary for geologists, mineralogists, archaeologists, hydrologists, or engineering survey crews blazing a trail to painstakingly record physical landmark bearings to identify selected sites for work crews who will follow. They need only take note of the time at which they arrive at a likely location. By translocation, the computer at their base camp will keep a precise record of their search whenever they are in view of a satellite. The process will be passive on their part, and automatic.

The sea, Earth's last great frontier, covers 71 percent of the world's surface. A dark, cold, forbidding

habitat, it is largely unexplored in depth and only primitively utilized, yet it will increasingly affect the daily lives of people throughout the world. It is rich in food and mineral resources.

The economic potential of the ocean is vast. The nation's oceanographic spending is now about \$500 million annually and rising rapidly. Estimates are that by 1975 it will cost in the neighborhood of \$5 billion for necessary undersea research, life-support studies and marine operations to keep our country in the forefront when it comes to tapping this great storehouse of natural resources. The Cachalot diving system permits man to live and work undersea for as long as a week. Deepstar-4000, the free-swimming, three-man research submersible, has completed over 100 dives to 4,000 feet.

This fall, Sealab III placed aquanauts in a working habitat 600 feet below the surface off San Clemente Island, Calif. They are performing everyday tasks like the deep sea salvage, oceanographic and bathyconstruction experiments that were conducted during the 1965 prolonged submergence of Sealab II, testing man's ability to live and work beneath the sea.

Being designed is Deepstar-20,000 for use at depths to nearly four miles. The Navy's Deep Submergence Search Vehicle (DSSV) will be the first of a sophisticated class of vessels capable of performing investigatory operations at 20,000 feet. An Arctic research drift vessel is under design for the National Science Foundation, housing 45 men, several years' food supply, laboratories, shops, medical

and recreational facilities, aircraft and hangar, and a small nuclear reactor for atomic power.

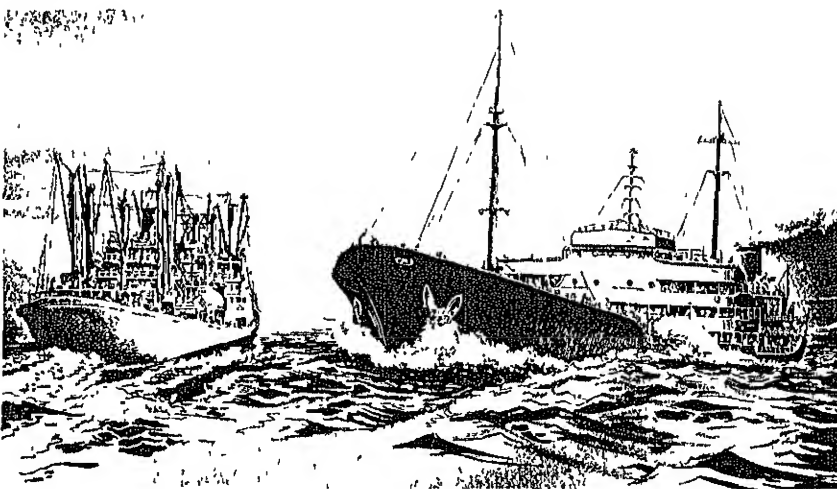
What do the precise positioning references contributed by the Navy Navigation Satellite System mean to oceanography, cartography, or to any long-term survey situations such as these, where it is necessary to develop a continuum of scientific data concerning a locale or environment? It means you need only to go there with System equipment to fix your true position, or to return to it at any time you choose.

Geologists prospecting for offshore oil have not been blind to indications of the presence of other valuable minerals, metals and gems dredged up from the bottom of the seas. The technology for mining them is somewhat behind that of the oil industry, but not so far behind as are legal decisions toward establishing proprietary leasing rights to such claims.

The mere existence of this unexploited undersea wealth on the continental shelf means pressure exerted by industry which legislators cannot long ignore. Unless these decisions are reached carefully and definitively, with common accord and uniformity, a scramble of prospecting beneath the ocean floor could take place that would make the '49ers, the Alaskan sourdoughs, and the Sooners on the Cherokee Strip look like games of musical chairs. One thing the legislators having going for them now is that prospectors, using the Navy Navigation Satellite System, can stake a claim that can't be jumped.

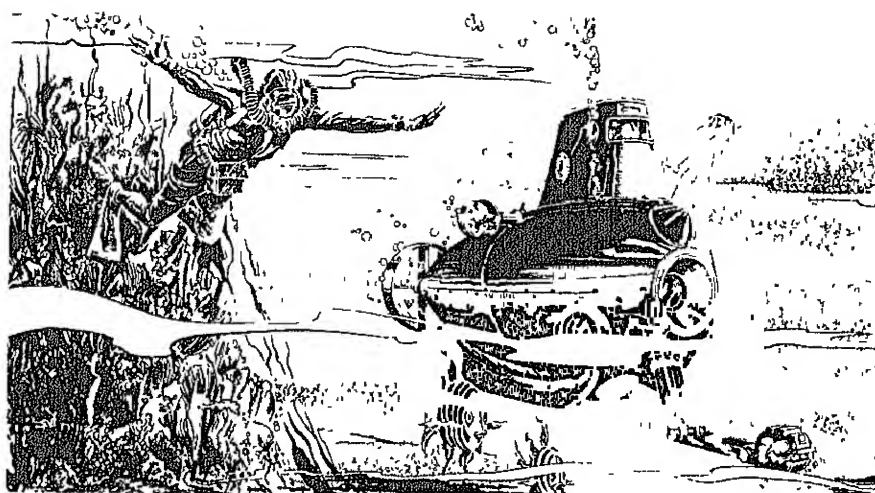
As the ocean becomes an increasingly precious commodity, the so-called "freedom-of-the-seas" policy will be increasingly challenged. As technologies become progressively proficient at extracting treasure from the ocean deep, and as prolific populations continue to overrun agricultural areas on land and become more dependent upon the ocean's yield, some way must be worked out to draw up new agricultural and industrial frontiers at sea. This problem will confront coming generations, but the problem is no less real for being over the horizon, and its solution will almost certainly lie in setting up boundaries that will be fixed by satellite.

Before then, it is likely that agreements will be reached regulating industrial expansion seaward to a dis-



tance that will be compatible with developments in commercial fishing, mining and farming of the seas. This expansion will probably parallel our own frontier pattern so familiar to Americans, starting from scratch as wild country open to hunters and trappers—in this case, fishermen. The next step will be for the new territory to become open range for cattlemen, or their marine counterparts, professional cultivators and growers of seafood for markets ashore. Gradually, the littoral will be split up into the farms of hydroagronomists growing and harvesting algae, kelp, and like sea-vegetation containing great food values. They will group together near central supply depots, processing plants and factories to form settlements and communities which, in the Jules Verne world of tomorrow, may well merge into cities in the sea. The fences dividing these farms—the point at which Farmer Dowd's south forty ends and Fisherman Jenkins pasture begins—will probably be established by navigation satellites.

Recently, much has been said comparing our exploratory efforts in space with those of inner earth, particularly the ocean depths. There seems to be a general feeling that proportionately more of these efforts should be diverted toward the latter, in the light of scientific opinion that the time is not far off when the Earth's exploding population will become increasingly dependent upon the sea for subsistence. Such comparisons are not entirely valid. Each effort complements the other. Paradoxically, the computer-recorded behavior of navigation satellites in thousands of orbits in space is telling us more and more about the shape, inner distribution of mass and shifting crust of the Earth we live on, and about the forces that surround it. The orbital behavior of navigation satellites tends to confirm many modern conclusions that our "globe" is really oblate from some viewpoints, or pear-shaped with a dimple in the South Pacific and a pimple in the North Atlantic, depending on how you look at it. Every geodetic advance that further perfects our "model" of the Earth is incorporated in orbital computer programs to improve the accuracy of the Navigation Satellite System. The precise positioning provided by navigation satellites enables us to grid land mass, polar icecap, equatorial jungle,



desert waste, Arctic morass, or the ocean floor and explore each of them systematically, taking up tomorrow where we leave off today.

So far, we have speculated in far-out terms about some downstream situations wherein pinpointing-by-satellite will enable development of new areas for industrial expansion. Let's narrow down to a closer look at the present state of the satellite art and what it means to industry.

Although it is the intent of this article to talk to industry about the effects upon our industrial economy of public disclosure of the Navy Navigation Satellite System and authorization for commercial production of satellite user equipment, there is one item of military development that is of such interest to defense contractors dealing in electronic hardware as to warrant inclusion here. To rebut the ironic popular comment, "If it works, it's obsolete!" in which there sometimes appears to be more truth than poetry, positioning-by-satellite capabilities are planned for many more surface ships of the line and type commands than presently carry navigation sets onboard. To date, only some of our attack carriers and cruisers have been equipped to use the Navy Navigation Satellite System. This fact constitutes reassurance to industry that the system will be operated by the Navy according to a basic satellite configuration that will remain unchanged, although we are only at a point in the Satellite Age roughly comparable to the first aircraft landings on the deck of the U.S.S. Langley.

To quote once more from Vice

President Humphrey's address, "There is, of course, no commitment by the Navy to maintain the system indefinitely for non-military use. However, recognizing the need for strengthening our world-wide navigational capabilities, the Marine Sciences Council has requested the Department of Transportation to prepare a recommended plan for meeting future non-military navigational requirements with consideration given to the role of land-based radio systems and navigational satellites." Industry may be confident that commercial user equipment will continue to be compatible with navigation satellites for years to come.

Now, you can establish your position with certainty anywhere on Earth, confident that you will be able to return to that spot tomorrow, next month, or years from today. Marine research institutions have been quick to climb aboard, particularly those which specialize in extensive studies of underwater currents and under-seas viewing techniques.

The Lamont Geological Observatory of Columbia University was permitted to fabricate four navigation satellite receivers in-house for their own use aboard research vessels and on ice islands in the Arctic Ocean. At the conclusion of these experiments, they wrote to the Assistant Secretary of the Navy for Research and Development, "We have had extensive experience with the Navy Navigation Satellite System and have found it extremely useful. It has introduced a new era for oceangoing research of all types, especially for oceanographic research . . . we view

it as the most important contribution to Oceanography in thirty years, opening possibilities of oceanographic research which have thus far been denied to all." The letter suggests that the System be adapted for use in a free-drifting buoy project to measure ocean currents both on the surface and in depth which could pay off on a grand scale, speeding ships on their way by utilizing these ocean forces rather than setting courses that require overcoming them by brute strength.

The Bureau of Commercial Fisheries, Department of the Interior, has expressed interest in development of a simplified receiver to be incorporated in another liberty buoy concept to follow the wanderings of plankton fish-feeding beds. In analysis, they write, "Presently, they (the buoys) offer the advantage of providing directly an estimate of surface drift, and they have the disadvantage that they require some positioning method, both to use the data and recover the buoy. We have felt that a simple passive receiver, recording doppler counts from a navigation satellite, could be provided at a relatively modest cost, and make such drifting buoys useful and available." After the buoy has drifted for a period of time, it may be interrogated or recovered, and stored doppler counts "navigated-after-the-fact" to find out where the buoy—and the phytoplankton—have been. The Applied Physics Laboratory of Johns Hopkins University is conducting preliminary design studies of some simple, prototype buoy navigation receivers to provide environmental data of value in fisheries research as a basis for recommendations to the National Buoy Program administered by the U.S. Coast Guard.

When the oceanographic ship *Argo*, belonging to the Scripps Institute of Oceanography, sails from Colombo, Ceylon, on a 61,000-mile voyage, she will carry aboard a Magnavox 702, one of the first commercially available satellite receivers. The *Argo* will depend heavily upon satellite navigation for position references, since she will be operating in research areas where land-based positioning systems do not exist, or perform marginally at best, during the height of the monsoon season when a prevailing overcast severely limits any chances for celestial observations. The *Argo* will

be conducting a wide variety of research projects, ranging from measuring currents induced at the equator by Earth's motion to plotting the drift of plankton beds in the Bay of Bengal and the Indian Ocean. A typical day's operations may involve cruising to a particular site, lying-to while certain research projects are performed, and then sailing off in random search of plankton beds measuring their extent and logging their drift and heading, and finally returning at sundown to the scheduled itinerary. Periodically, research buoys will be lowered overside, anchored, and their positions noted, to be located weeks later—by satellite positioning references—on a return leg of the voyage. The Navy Astronautics Group will be interested in progress reports received from the expedition, constituting a long-term performance test of an industry version of the satellite receiver under exacting conditions at sea.

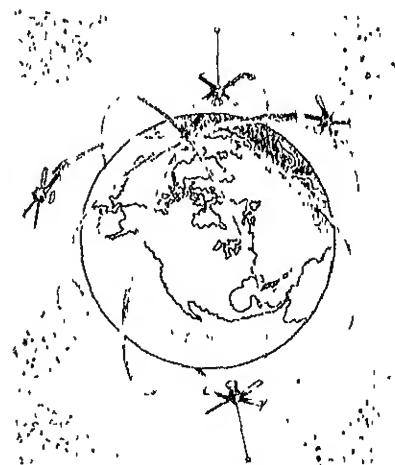
Traditional dividing lines between strictly military and civil underseas research are gradually dissolving. Exploration of the deep oceans, and their use, tends to submerge divisive factors beneath the larger realm of our national interest. On April 17, 1968, the Secretary of the Navy noted, "The growing involvement of the Navy's oceanographic program with scientific, educational and industrial communities indicates the need for direct information channels to these areas."¹

There is no area of oceanography, ocean engineering and development that is not of interest to the Navy. Institutional and industrial underseas research teams increasingly work hand-in-hand with Navy technology; a large portion of this work is presently underwritten by the Navy with this in mind. The Navy Navigation Satellite System represents a major breakthrough for the performance of oceanographic research contributed by the Navy to this joint effort. About 30 commercial navigation satellite receivers have been ordered initially by oceanographic, geodetic and geological study groups at private and state universities. These will be distributed through the Office of Naval Research.

¹SECNAVNOTE 5720, Appendix V, "Oceanography," April 17, 1968.

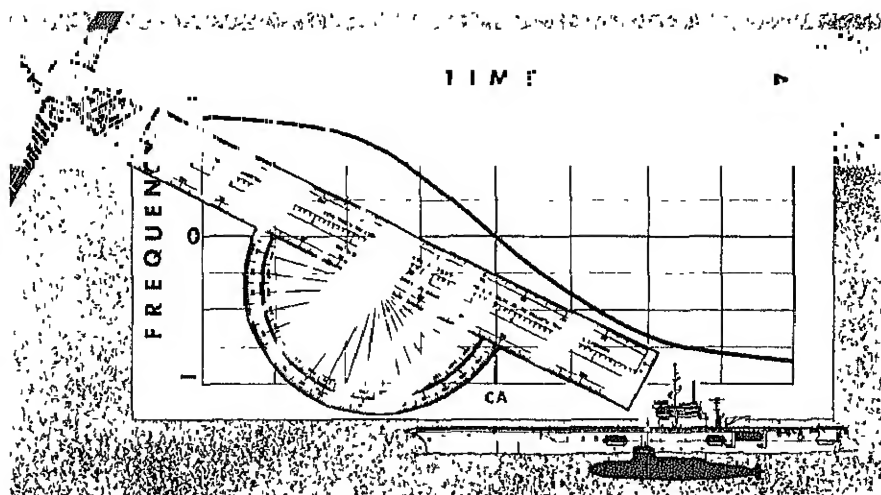
Manifest benefits derived from positioning-by-satellite have been turned to good account by the Navy through installation of military navigation sets aboard cable laying and repair ships. Similarly, industrially-owned vessels engaged in this type of work, e.g., the the C.S. Long Line belonging to the American Telephone and Telegraph Co., have recently had installed equivalent commercially produced user equipment—in this case, the Magnavox version.

Navigation-by-satellite readily associates with other navigation aids or dead reckoning systems to their mutual benefit. Navigation satellites complement inertial or hyperbolic radio navigation systems by providing an accurate position fix often enough to reset inertial navigation systems or to validate positions acquired through radio reckoning. Although this would suffice for most functions, some survey ships require a precise measurement of their positions equal to or better than the excellent accuracies demonstrated throughout the last four years of operational use by the Navy. Such an improvement can be obtained by translocation techniques used in combination with any ground-based hyperbolic navigation system, such as Loran, commonly found aboard ships engaged in this line of work. Used in this connection, satellite positioning obviates weather and ground, and skywave error factors inherent in low frequency wavelengths that have proven to be detrimental to the accuracies obtainable, especially at long range. On the other hand, navigation satellite computations must know the ship's motion during a satellite pass,



and that factor is readily available from any continuous navigation system. Some industrial applications requiring such hairline accuracies, which do not have this type of equipment on board, plan to use the Marquardt Corp.'s Doppler Sonar Velocity Equipment to provide an extremely accurate velocity input to the positioning data of a ship underway, either manually or on-call through computer interface.

The Navy Navigation Satellite System is a practical reality. It works. The Applied Physics Laboratory of Johns Hopkins University is responsible for the concept, design and development of the system. Based upon earlier conclusions of Drs. W. T. Guier and G. C. Wiffenbach, Dr. F. T. McClure suggested this new positioning method which won for him the first NASA award for important contributions to space development. He demonstrated that measurement, in terms of frequency and time, of doppler shift in signals generated by a satellite of known orbit could be used to fix one's position on Earth. The System was developed for the Navy by one of our country's most distinguished scientific teams led by Dr. R. B. Kershner of the Applied Physics Laboratory. The System is fully operational. Since April 1962 it has been managed on a round-the-clock, year-long basis by the Navy Astronautics Group. It marks the first continuous use of space technology in direct support of the Fleet. Its use is being further extended by installation of satellite receiver equipment aboard an ever-increasing number of fleet units, and now the System has been cleared for private scientific and industrial exploitation. Proven results demonstrated by long-term operation of navigation satellites by the Navy Astronautics Group and successful use of these spacecraft by the Fleet have attracted widespread attention throughout the scientific community. Practical demonstration of the everyday usefulness of the Navy's Navigation Satellite System has acted as a springboard, stimulating the interest and imagination of science-in-industry. Several ideas which could refine, broaden, or complement the established operational system have been advanced by military, institutional, and industrial organizations in a healthy competitive scientific atmosphere. Most of these proposals have been reported in space periodicals and oceano-



graphic and navigation "trade journals."

One suggestion deals with adapting ordinary merchant vessels to perform surveys calling for ultra-precise position references, through installation of commercial satellite receiving equipment. One factor which affects the degree of accuracy obtainable through the Navy positioning-by-satellite system is correct measurement of the ship's velocity during satellite reception. Such ships rarely afford the luxury of a computer on board, or of any of the high-quality position systems that yield this information. The "trade papers" tell us that industry is exploring comparatively low-cost ways to calculate ship's true velocity over the Earth more efficiently by measuring proportional voltages, local signal transmission times through the water alongside, or doppler sonar bounce.

Aerospace magazine, the official quarterly publication of the Aerospace Industries Association, mentions the report submitted by a joint Space Applications Study Group from the National Academy of Sciences and the National Research Council, speculating on potential side applications of Navy navigation satellites among other subjects on its agenda. This report concluded that "it is quite probable that a relatively unpublicized part of the space program, directed toward realizing practical benefits to be derived from it, will ultimately prove to be the most significant to mankind." This study is only one of many that are underway concerning valuable "by-product" applications associated with the satellite

system operated by the Navy Astronautics Group.

At an isolated outpost belonging to an international network devoted to furthering geodetic knowledge for purely scientific purposes, the operators on duty tune to frequencies generated by a passing navigation satellite to set their "station clock." The first phase excursion in a fiducial timemarking BEEP frequency occurring every two minutes throughout satellite broadcasts will serve to synchronize station oscillators that approach an atomic clock in 24-hour accuracy. The validity of the tracking station's recorded scientific observations depends upon it.

Navigation satellites naturally suggest themselves as vehicles for universal time dissemination to synchronize timekeeping throughout the world. Right now, the time markers, precisely interspaced in data which navigation satellites continuously generate, are used to set clocks at widely scattered stations around the globe.

According to the U.S. Naval Space Surveillance System (SPASUR), a national agency that keeps track of all orbiting spacecraft and space "junk," there are more than a thousand artificial satellites in space. Approximately a twentieth of these are utilitarian, i.e., they perform services that directly affect the everyday life of the populace below. Telstar, the communications satellite which relays color telecasts between Europe and the Americas and ESSA, whose cloudcover pictures of the United States appear daily on tele-

vised weather reports, is perhaps the most widely known to the public.

Because they perform so consistently in accord with laws of gravity and motion laid down by Sir Isaac Newton and Johannes Kepler, Earth-orbiting satellites are classic examples of constancy combined with wide coverage. They are useful to us as time-clocks in space to motivate operations requiring split-second timing on Earth, particularly when they are used in conjunction with two other highly significant technological developments of this decade—near-perfect time control and measurement in terms of frequencies generated by ultra-stable oscillators, and modern-day advances in the computer arts.

Navigation satellites are here to stay. They have already demonstrated sufficiently widespread industrial applications, expanding our economic outlook to justify expectations that there are again as many other applications yet undreamed of. It remains for science-industry to come up with these ideas. Perhaps the best way to take the first step in this direction is for industry to ask itself, "What can the Navy Navigation Satellite System do for me?"



Gordon Lange is Special Asst. for Information, Navy Astronautics Group. A Navy civilian employee since 1946, he has been head of Systems Information Div., Navy Astronautics Group since 1962. He has worked as art director in civilian advertising agencies. He attended Trinity and Barnard schools, N.Y., Williams College, Mass., and studied at the Art Students League, New York City. Mr. Lange both wrote and illustrated this article.

DCAS On-Site Engineering Services Furnished at Contractors' Facilities

Defense hardware today consists of some of the most technically complex equipment in the world. It is designed by engineers and, in many cases, built by engineers.

As the various items of military supply come down the production lines across the country, government engineers are on site, working with the contractors, helping to answer engineering problems.

These government engineers are key members of the Defense Contract Administration Services (DCAS) teams of the Defense Supply Agency which are responsible for defense contract administration.

About 600 DCAS engineers are either permanently assigned in plants of large defense contractors or act as mobile engineering consultants.

Mobile consultants provide a technical communications link between military procurement offices, contract administrators and contractor executives by visiting company facilities to consult with company engineers.

The mobility of DCAS engineers makes it possible for them to be available on short notice when engineering problems arise on a contract.

Here is what DCAS engineers provide for the defense contractor:

- Anticipate engineering problems resulting from inadequate specifications or engineering documentation, economic conditions, management, or other areas, and take necessary actions to avoid or minimize their impact.

- Interpret specifications and contract engineering clauses.

- Act as the procurement activity's engineering representative when delegated that authority.

- Assist in resolving engineering, production and quality problems.

- Relay, explain and amplify changes initiated by the procurement office and observe how these changes are made.

- Obtain technical assistance when required.

- Assist in establishing a value engineering program and in submission of value engineering change proposals.

- Explain contractor problems to procuring office engineering staff personnel to obtain fair and timely

solutions.

Here is what DCAS engineers can provide for the program manager:

- Comment on engineering studies, designs and proposals.

- Ensure that the contractor complies with engineering requirements of the contract and technical support documentation.

- Assist in evaluating contractors' engineering and management control systems.

- Encourage the contractor to originate design change proposals which result in improved products at less cost, thus producing reportable savings for the procuring agency through cost reduction and value engineering.

- Monitor contractor performance to assure that technical requirements of the contract remain up to standards during the life of the contract.

- Provide on-site technical support in production, quality and engineering actions incident to contractor performance.

- Provide continuous liaison services with the defense contractor to ensure accurate interpretation of the program manager's changes and redirection.

Pamphlet Available on Civil Defense Training for Industry

A 16-page illustrated pamphlet that lists civil defense training courses of particular interest to industry has been published by the Business and Defense Service Administration, Department of Commerce, in cooperation with the Office of Civil Defense.

Titled, "Civil Defense Training for Business and Industry," the new publication lists courses oriented toward both peacetime and wartime disasters, including those dealing with nuclear weapons protection.

The booklet can be obtained from local civil defense offices or from the Assistant Director of Civil Defense (Industrial Participation), Office of Civil Defense, The Pentagon, Washington, D.C. 20310.

Standardization of Components/Equipments

Frank Berg

In 1966, the Chief of Naval Material (NAVMAT) initiated a standardization program directed by NAVMAT Instruction 4120.97, titled "Standardization of Components/Equipments (C/E) Required for Fleet or Ashore Support." This instruction was the result of a 1965 study guided by the Deputy Chief of Naval Operations (Logistics) and the Chief of Naval Material to describe and analyze Navy logistic support, and to recommend remedial action for problems identified. The proliferation of equipments and components in the hull, electrical and machinery areas of the Navy had reached such proportions that a formal program was necessary in order to give visibility to progress made in the hardware standardization effort. The Chief of Naval Material included the electronics area in the program since it had similar problems.

This article describes the program relating to the standardization of electronics components and equipments (C/E) under the cognizance of the Naval Electronic Systems Command. The subject of standardization of components and equipments having naval application and managed by the Naval Material Command has been discussed in two articles appearing in the *Defense Industry Bulletin* (see "Standardization—The Answer to the Fleet Spare Parts Dilemma," January 1968, page 1; and "Standardization of Component/Equipment in the Naval Material Command," April 1968, page 14).

Lack of standardization has resulted in an excessive number of components and equipments with limited application and many with poor performance histories. Their use complicates logistic support, leads to ex-

cessive costs, excessive stocks of spare parts, and a proliferating increase in training requirements.

The NAVMAT Component/Equipment Standardization Program applies to all elements of the Naval Material Command covering all hardware, and covers all phases of system development, acquisition and maintenance of the hardware. It encompasses all systems, subsystems, equipments and components under the cognizance of the Naval Material Command, including aviation, ordnance, ships, electronics, and construction equipment. Stated in the broadest terms, the policy of the program is to:

- Include hardware standardization requirements in concept formulation, contract definition, procurement, production, maintenance, conversion, modernization and alternation.
- Standardize designs with inter- and intra-system standardization of C/E and parts.
- Reuse (in new design) existing, suitable C/E already supported in depth by the military system.
- Preclude use of limited application and poor performance C/E.
- Exercise configuration control to maintain standardization.
- Use procurement techniques to restrain proliferation.
- Effect item entry control in design selection and provisioning phases of material acquisition.

The attainment of an optimum degree of standardization by curbing C/E make and model multiplication, and resultant spare parts proliferation, must be within the bounds of the Armed Services Procurement Regulations (ASPR) and any governing requirements of the Defense Standardization Program. Standardization cannot be mandated arbi-

trarily but must result from thoroughly considered trade-offs, generally on the basis of total cost versus effectiveness.

By definition, the term "components/equipment" as applied here is defined as repairable items which either do require repair part support or will require it when introduced into Naval operating forces, afloat or ashore. In the electronics area, this program



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The author gratefully acknowledges the assistance of A. J. Gugler, W. L. Heltman and G. B. Gustafson of the Electronics Standards Office, Naval Electronic Systems Command, in the collection and analysis of data used in this article.

does not apply to repair parts such as capacitors, resistors, transformers, etc., but such equipments as transmitters, receivers, modems and repairable components, etc. The kinds or types of material to which Naval Electronic Systems Command (NAVELEX) is applying the policy of the NAVMAT instruction are those for which it has material support responsibilities assigned by command charter.

As of February 1968, these were:

- Shore (ground) electronics, complete.
- Shipboard electronic equipment under system control of the Naval Ship Systems Command, as follows: IFF (Identification Friend or Foe), electronics countermeasures, communications, and navigational aids.
- Undersea Surveillance System.
- Material support for Naval Air Systems Command electronic equipment, as follows: navigational aids, air traffic control, and meteorological electronic items.
- Space programs, satellite communications and material support of space surveillance.
- Shore-based strategic data systems; operations control centers.
- Data-link systems (external to ships and aircraft).
- Radiac equipment.
- General-purpose electronic test equipment, components, techniques, and services.
- Electronic systems not otherwise assigned.

The task for the standardization of electronics components and equipments is a difficult one. The dynamic changes in the state of the art, the complexity of equipments and systems, the preoccupation of the operating and engineering communities to specify more advanced, more reliable, more maintainable, smaller and less power consuming electronic hardware to meet changing military requirements are some of the forces at work with which standardization has to deal.

With these difficulties in mind, the immediate goals for standardization of NAVELEX components and equipments are, first, to determine the background and status to NAVELEX cognizance material and, second, to apply standardization planning and action. Background means the identification of a component and/or equipment and its association with one or more military requirements.

Status means the performance ability of a component and/or equipment to meet one or more military requirements. Terms applicable to shipboard C/E authorized by the Office of the Chief of Naval Operations, known as suitability status classifications, are used to categorize performance ability. These are:

- **Planned Standard.** Classification denoting those equipments under evaluation or consideration. Approval for service use and classification is required for equipments in this category prior to installation.
- **Standard.** Classification denoting the most advanced and satisfactory equipment approved for service use. These are preferred for procurement.
- **Substitute Standard.** Classification denoting those equipments approved for service use which do not have as satisfactory military characteristics as Standard equipments. When necessary, these may be procured to supplement the supply of Standard equipments.
- **Limited Standard.** Classification denoting those equipments approved for service use which do not have as satisfactory military characteristics as Standard or Substitute Standard equipments, but are usable substitutes. Complete major units will not be procured, but component parts, accessories and complementary articles, even though they may also be Limited Standard equipments, may be pro-

cured if necessary and economical to maintain complete major units in serviceable condition throughout a reasonable life expectancy.

- **Obsolescent.** Classification denoting those equipments which no longer have satisfactory military characteristics, but which must be continued in service pending availability of improved replacements. Complete units, component parts, accessories, and complementary articles will normally not be procured for the specific purpose of maintaining this equipment. Spare parts common to other equipment in the supply establishment may be used, however, for their maintenance.
- **Obsolete.** Classification denoting those equipments which have been declared unsuitable for their original military purpose. Disposal of stocks of obsolete equipment will, in all cases, be expedited.

The previously mentioned goals, i.e., to determine background and status of NAVELEX material and, secondly, to apply standardization planning and action utilizing these classification terms, are implemented by a number of tasks which are included presently in the standardization plan described by NAVELEX Instruction 4120.1. The interplay of these goals, terms, and tasks are shown in Figure 1.

Referring to Figure 1, notice that potential NAVELEX C/E, the need for which is generated by a military

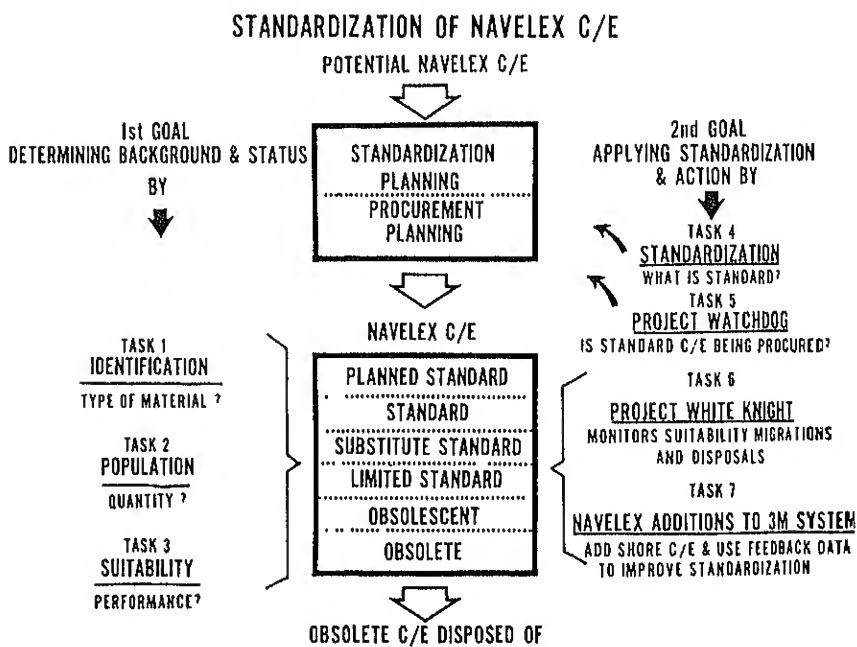


Figure 1.

SUMMARY OF POPULATION DATA (TASK 2) AND SUITABILITY ASSIGNMENTS (TASK 3)
FOR NAVELEX COMMUNICATIONS EQUIPMENT AFLOAT (ACTIVE FLEET)

# OF SCAT ASSIGNMENTS ASSOCIATED WITH C/E TYPES	TYPE OF C/E	VARIETY OF NOMENCLATURED TYPES		SUITABILITY CLASSIFICATION AND C/E POPULATION AFLOAT (ACTIVE FLEET)						TOTALS
		WHEN COUNTED WITH SUFFIXES	WHEN COUNTED WITHOUT SUFFIXES	PLANNED STANDARD	STANDARD	SUBSTITUTE STANDARD	LIMITED STANDARD	OBSOLESCE	OBSOLETE	
16	RADIO TRANSMITTERS	97	36	0	2 702	1 496	62	6	3 989 ^(a)	8 255
11	RADIO RECEIVERS	114	42	11	1 273	2 325	4 077	5 664	3 603 ^(b)	16 953
34	RADIO TRANSCIVERS	99	43	0	3 214	292	3 235	2 827	2 115 ^(c)	11 683
16	MODEMS	50	16	0	384	0	0	0	0	384
21	TELETYPES	119	67	0	6 185	4 358	1,749	2 381	443	15 116
TOTAL 98		479	204	11	13 758	8 471	9 123	10 878	10 150	52 391
% SUITABILITY CLASSIFICATION DISTRIBUTION OF 52 391 C/E				02%	26.26%	16.17%	17.42%	20.77%	19.36%	

NOTES: *SCAT: Sub Category Requirement i.e. breakdown of functional requirements to be met by certain functional types of equipments and components such as transmitters, receivers, etc.
 Suffix is defined as an alphabetical letter added to the basic nomenclature i.e. AN/WRC 1B The B is the suffix.
 (a) 97.9% or 3873 Transmitters consist of 6 nomenclatured types.
 (b) 95.8% or 3453 Receivers consist of 5 nomenclatured types.
 (c) 98.7% or 2089 Transceivers consist of 5 nomenclatured types.

Figure 2.

requirement, starts at the top and in the center of the figure. Then in succession there is standardization planning, procurement planning, and as the material is procured, the various NAVELEX C/E flow into the rectangle which symbolizes installation in the operating forces, and become stratified according to their suitability status classification, i.e., their ability to meet the military requirement for which procured. In the desired life-cycle history of C/E, material would start as a Planned Standard and migrate to successively lower strata classifications and, finally, to Obsolete C/E which is drained off when disposal takes place. The NAVELEX Standardization Plan then surrounds this basic flow and is implemented by the seven tasks identified in Figure 1.

The program responding to this plan is evolutionary due to the broad range of material and actions involved. Further tasks will be instituted as the program evolves. To determine the background and status

of NAVELEX C/E, studies under Task 1, titled "Identification of NAVELEX C/E," have revealed approximately 9,000 differently nomenclatured or otherwise identified C/E recorded as having been used or being used afloat. Similarly, a total of approximately 18,000 differently identified NAVELEX C/E were or are applicable to use ashore. Many find application both ashore and afloat. Task 2, titled "Population Data for NAVELEX C/E," provides for a count in depth of these numbers of C/E presently installed afloat and ashore. Involved are both the active and reserve fleets, and all activities in the Naval Shore Establishment such as naval communication system radio stations, fleet training centers, reserve training centers, support activities, etc. With NAVELEX C/E identified and population counts made, Task 3, titled "Suitability Assignments for NAVELEX C/E," then determines the suitability status classification assignments, i.e., Planned Standard, Standard, etc. Tasks

1, 2, and 3 together provide the background and status for the second program goal which is to apply standardization planning and action.

Some results of Tasks 1, 2, and 3 involved in a study of 52,391 NAVELEX C/E installed afloat, consisting of radio transmitters, receivers, transceivers, modems and teletypes, are tabulated in Figure 2.

A significant fact found in this study is that 97.9 percent of the Obsolete transmitters consist of only six nomenclatured types; 95.8 percent of the Obsolete receivers and 93.7 percent of the Obsolete transceivers consist of only five nomenclatured types each. This may be explained by the practice followed for many years of consolidating purchases of major shipboard electronic C/E as government-furnished equipment (GFE). Essentially such practice has placed a degree of control on what otherwise could have been unbridled proliferation of many types of C/E for given operational requirements. The fact that sizeable numbers of

NAVELEX COMPONENT/EQUIPMENT STANDARDIZATION

1. STANDARDIZATION OF GENERAL PURPOSE TEST EQUIPMENT

EQUIPMENT CATEGORY	FUNCTIONAL REQUIREMENTS	EQUIPMENT TYPES USED	STANDARDIZATION ACTION TO SATISFY FUNCTIONAL REQUIREMENTS AS OF 2/68
OSCILLOSCOPES	19	66	3 TYPES NOW STANDARD
	2	6	3 TYPES PLANNED STANDARD
	21	72	TOTAL 6 TYPES PLANNED PROCURE FY 69
SIGNAL GENERATORS	7	23	3 TYPES NOW STANDARD
	13	50	3 TYPES UNDER DEVELOPMENT
	20	73	TOTAL 6 TYPES PLANNED PROCURE FY 70
ELECTRONIC COUNTERS	6	27	TOTAL 2 TYPES NOW STANDARD

2. STANDARDIZATION OF CERTAIN RADIO TRANSMITTERS, RECEIVERS, AND TRANSCEIVERS

RADIO TRANSMITTERS	5	18	TOTAL 3 TYPES NOW STANDARD
RADIO RECEIVERS	6	28	TOTAL 5 TYPES NOW STANDARD
TRANSCEIVERS	3	4	1 NOW STANDARD
	12	11	2 TYPES PLANNED STANDARD
	15	15	TOTAL 3 TYPES PLANNED PROCURE FY 70

Figure 3.

Obsolete transmitters, receivers and transceivers are concentrated in so few nomenclatured types indicates that consolidating purchases assists in promoting standardization for a period of time.

To further promote standardization, the invoking of the multi-year instead of the single-year method of procurement even further serves to limit the proliferation of different type C/E for a requirement. Under the ASPR, if the multi-year method of procurement is invoked in a contract, the successful bidder may produce the C/E up to a maximum of five years rather than one. Thus, when electronics C/E is procured by the multi-year method, particularly where performance type specifications are involved, proliferation is reduced providing no engineering production changes are made on the contract involved. However, to keep a Navy standardized with hardware which is the product of an art as dynamic as electronics, for which military requirements are being changed or upgraded, is a very difficult task. Where C/E has been declared unsuitable for its original military purpose, a desirable and systematic replacement rate of installed Obsolete C/E has been prevented by limited annual funding levels and other budgetary priorities.

With the background and status of a family of NAVELEX C/E obtained, such as previously illustrated, Task 4, titled "NAVELEX C/E Standardization," then comes into play. This task provides visibility for standardization planning and action. Figure 3 illustrates Task 4 standardization accomplishments to date for certain general purpose oscilloscopes, signal generators, electronic counters and a number of shipboard radio transmitters, receivers and transceivers. Additional families of C/E are under study to establish background and status information, and then the goal of standardization. Documentation from which these studies are derived has influenced the selection of shipboard C/E first. It is anticipated that standardization studies of C/E for the Naval Shore Establishment will be far more difficult, since an applicable suitability status classification system has yet to be implemented. NAVELEX has commenced action in regard to this problem by issuance of a NAVELEX instruction which provides a systematic method for dealing with NAVELEX C/E used ashore as well as afloat.

We now come to Tasks 5, 6 and 7. Briefly, Task 5, titled "Project Watch Dog," addresses the subject of NAVELEX C/E procurement. Task

6, titled "Project White Knight," monitors changes in the suitability status classifications of NAVELEX C/E, and provides orderly procedures for withdrawal of support when Obsolete C/E is no longer installed. Task 7, titled "NAVELEX Additions to the Navy Maintenance and Material Management (3-M) System," provides visibility for the standardized preventative maintenance and maintenance data collection effort applicable to NAVELEX C/E.

Task 5 (Project Watch Dog) monitors Procurement Requests (PRs) to determine the extent to which Standard NAVELEX C/E is being procured, and appropriate military specification and standards are being cited in the PRs. It provides for feedback information to technical and logistic support organizations within NAVELEX to use as a basis for initiating or accelerating standardization programs for NAVELEX C/E. Full implementation of this task is dependent upon the assignment of suitability status classifications, where possible, to NAVELEX C/E used ashore and those used afloat having no assignments. When this occurs, this task will be able to more effectively police the degree that standardization is occurring each year as a result of procurement action.

At this stage in the evolution of the overall program, Project Watch Dog is making an analysis of C/E being procured. Two hundred and ten PRs available were analyzed under the following three categories:

- Research, Development, Test and Evaluation (RDT&E) and Software Studies. Procurement of RDT&E in technologies involving vacuum tubes and solid state, electro-optics, microwave, communications, special surveillance, field measurements, etc.; and studies involving cost effectiveness, electromagnetic compatibility, communications, etc.

- Hardware. Procurement of shore and shipboard electronics C/E involving communications, IFF (Identification Friend or Foe), electronic countermeasures and navigational aids, air traffic control, meteorology, radiac, general purpose test equipments, etc.

- Services and Miscellaneous Items. Procurement of engineering services, training assistance, modification kits, ancillary components used in installation, etc.

The purpose of this analysis was to determine the nature of what was being procured in order to orient the standardization effort. It became apparent from this analysis that the hardware category, comprising 65 percent of the 210 PRs analyzed and 59 percent of the total dollar value, was the prime area of interest to concentrate the standardization effort. This is the category where the standardization actions are taking place.

Task 6 (Project White Knight) monitors the migration or changes to NAVELEX C/E suitability status classifications, the disposal of those designated Obsolete, and the eventual elimination from the supply system of repair parts peculiar when no C/E remains. This task provides an orderly means of communicating to the Electronics Supply Office (ESO), Great Lakes, Ill., the changes taking place in the suitability status classification of NAVELEX C/E and a resulting change that may be required for repair parts support of the NAVELEX C/E affected. When Obsolete C/E is eliminated from installations, this task provides the trigger for informing ESO to cancel the Allowance Parts Lists (APLs) and commence declaring parts peculiar to the C/E involved excess to the needs of the supply system.

A total of 36 suitability status classification changes occurred during 1967. Of this number, 16 C/E were designated Obsolete. By definition these are declared unsuitable for their original military purpose. Disposal of stocks are to be expedited. Of the 16 C/E designated Obsolete during 1967, 1,348 are installed afloat and 147 ashore. Prior to the cancellation of the Allowance Parts List, and disposal of parts peculiar for Obsolete C/E, installed quantities must be reduced to zero. Project White Knight provides visibility for a number of vital factors surrounding the important decision of taking the final step of withdrawing interest and disposing of Obsolete C/E.

Finally Task 7 (NAVELEX Additions to the 3-M Systems) provides visibility to the number of ashore-installed NAVELEX C/E planned for under the 3-M System. This task describes part of NAVELEX's effort in standardizing preventive maintenance and maintenance-data collection. The system consists of two subsystems. One is the Planned Maintenance Subsystem (PMS) which

includes the development of Maintenance Requirements Cards (MRCs), to provide standard scheduled maintenance procedures for each C/E and system. The other subsystem is the Maintenance-Data Collection Subsystem (MDCS) which includes the assignment of Equipment Identification Codes (EIC), resulting from an identification breakdown of shore-installed C/E into assemblies and sub-assemblies. These codes are used for C/E and system identification.

NAVELEX has the responsibility of providing maintenance support for NAVELEX C/E installed ashore. A pilot run is now underway to implement the 3-M System in shore facilities. A planned Maintenance Subsystem specification/purchase description has been completed for the procurement of MRCs with newly acquired NAVELEX C/E.

The Naval Ship Systems Command (NAVSHIPS) is the program manager for the 3-M System afloat. As of early 1968, 50 percent of all NAVSHIPS/NAVELEX nomenclatured electronic C/E used afloat and subject to the 3-M System were EIC coded. The Planned Maintenance Subsystem (PMS) applicable to electronics C/E has been delivered to 94 percent of the ships in the fleet.

The 3-M System input into the NAVELEX C/E Standardization Program provides an important source of data enabling decision on appropriate standardization status classification.

The proliferation of C/E used in systems and subsystems applicable to aviation, ordnance, ships, electronics, and construction equipment has become serious enough that formal programs have been initiated by the Chief of Naval Operations and the Chief of Naval Material for the Naval Systems Commands to develop all possible means of increasing standardization. C/E standardization, therefore, increases effectiveness and reduces costs for the Navy's use of its resources.

The NAVELEX plan of operation for standardization of material under its cognizance, as described in the foregoing, involves two goals. The first is to determine the background and status of NAVELEX C/E. The second is to apply standardization planning and action. A great engineering effort lies ahead due to the wide range of items involved.

Army Seeks New Methods for Soil Stabilization

The U. S. Army Combat Developments Command (CDC), Fort Belvoir, Va., is currently studying plans to provide better ground mobility by rapid soil stabilization and dust control. Realizing that present and future concepts of land and air operation are predicated on rapid reaction and high mobility of military forces, the CDC planners have completed a Qualitative Material Development Objective (QMDO) for soil stabilization.

A QMDO is a Department of the Army approved statement of a military need for development of new materiel. Speaking about methods to be used in development of soil stabilization, Major Theodore L. Doherty Jr., of the Mobility Division of the CDC Materiel Directorate and action officer on the project, said that "to achieve this objective the employment of new and different materials, techniques and equipment, other than the conventional means will be stressed."

When it becomes a reality, the rapid soil stabilization system will be used primarily by engineer combat and construction units to quickly stabilize road, beach, air landing, weapon firing, logistical storage, medical treatment facility, and other areas which require improved soil surfaces.

Army Tests New Gun-Tube Production Process

Auto-fretting, a process of applying extremely high pressure to the interior of a gun-tube surface to increase its serviceability, is now being applied for the first time to the huge 175mm gun by Army engineers.

The process is usually used only on small caliber weapons but engineers at the Army's Watervliet Arsenal in New York have produced six 175mm gun barrels using the auto-fretting technique.

If tests by the Army Test and Evaluation Command prove successful in increasing the service life of big weapons, auto-fretting may be used on a production basis for all future gun-tubes for the 175mm gun.



FROM THE SPEAKERS ROSTRUM

Unique Resources of Military-Industrial Team Can Benefit Total National Strength

*Address by Hon. Clark M. Clifford,
Secretary of Defense, at the Annual
Dinner of the National Security
Industrial Association, Washington,
D. C., Sept. 26, 1968.*

Since assuming my duties as the ninth Secretary of Defense, I have learned much about the valuable contributions the National Security Industrial Association has made to our defense posture. I am aware of your efforts to help us reduce costs. I know of the outstanding work of your advisory committees, which mobilize scientists, engineers and managers of industry to help us solve difficult technological problems.

I appreciate your efforts and, on behalf of the Defense Department, I thank you.

This assembly tonight is, however, something more than the annual dinner of a great organization. This audience is as close as one can ever come to assembling the leading representatives—in and out of uniform—of what General Eisenhower once referred to as the “military-industrial complex.”

All of us recall his last speech to the nation as President in January 1961. Recognizing the absolute necessity for a strong Defense Department and a large and sophisticated arms industry, he felt compelled to draw attention to the fact that their relationship involved some grave implications for the country.

In my view, President Eisenhower's warning is well worth pondering, for this complex represents an immense pool of resources. The capital, manpower, and innovative thinking in this unique combination of industry and the military are equalled nowhere in the world.

Were these resources to be misdirected, squandered, or consumed inefficiently, the American people would be poorly served indeed.

Inevitably, there is danger when one is talking about the expenditure of \$40, \$60, or \$80 billion a year.

Inevitably, there is danger when powerful industries present to Congress and to the Defense Department their logical proposals for new weapon systems or equipment. These are sincere proposals, designed to advance our military strength. The danger arises, not from some sinister intent on the part of the designer, but from the fact that this nation does not need and cannot afford every new weapon system which resourceful industry can design.

Inevitably, there is danger when each Military Department sincerely advocates maximum development of the weapons it would use in our national defense. There is danger when patriotic citizens mistakenly believe that something is good for the defense of our country just because potential enemies believe it is good for their country.

I am convinced today, after six months in this office, that the dangers General Eisenhower warned against were real dangers. But I am also convinced that they have been avoided, through the checks and balances of our governmental system. They have been avoided through the alertness of our Congress and the watchfulness of our press. They have been avoided because powerful pressures come from different directions and tend to offset themselves. They have been avoided by the strengthening of the Office of the Secretary of Defense. They have been avoided by the diligence of the Commander-in-Chief.

Industry and the military establishment, in partnership, have maintained a strong, modern and effective defense capable of meeting all tasks assigned by the President in support of our foreign policy and our national objectives. This nation has more mili-



Hon. Clark M. Clifford

tary power today, better balanced in its make up, and better tailored to meet potential military threats, than any country has had in the history of the world.

That is the posture of military strength we maintain—and I pledge that is the posture of military strength we will continue to maintain.

However, I want to talk to you tonight about the subject of our total national strength. This, it seems to me, is appropriate because it is my job as Secretary of Defense to see that our country has the security that it needs. And it certainly is your job as members of this association.

Security, as we have traditionally viewed it, is the protection of our country from external threats. Our military forces are designed against such external threats; the Congress appropriates funds for this purpose and the American people expect us to fulfill this mission.

The question I raise tonight is: What are the basic elements of our total national security? The answer, I think, is clear: first, the power of the weapons of our armed forces; second, the quality of the training and leadership of those forces; third, the unity of the American people. The most modern of weapons will be inadequate to insure our survival in today's world unless our society is keyed to the steady improvement of

our political institutions and concerned that all our people participate and share in the benefits of that society.

And I submit tonight that the Defense Department is not doing enough to promote in a positive way those aspects of our national life which are so essential to the preservation of our fundamental institutions.

What, after all, do the people most earnestly seek?

It would seem clear to me that our people want to secure their freedom. And it would seem clear that the elements of freedom are described in the Preamble to the Constitution of the United States more eloquently than anywhere else.

The establishment of justice.

Domestic tranquility.

The promotion of the general welfare.

The blessings of liberty.

It was for all those reasons that we sought to form a more perfect union, and it was for those reasons that the people of the United States did ordain and establish our Constitution.

But there are millions of Americans today who have not yet secured for themselves the elements of freedom set forth in the Preamble.

Assistance in Domestic Problems

I submit that the Defense Department, a Department which consumes 9 percent of the gross national product of our nation, a Department which employs four and one-half million Americans, has a deep obligation to contribute far more than it has ever contributed before to the social needs of our country.

Justice—domestic tranquility—general welfare—blessings of liberty. Can it be that these essential elements of freedom are a responsibility of the rest of the United States Government, but not of the Defense Department whose operations account for half of the total expenditures of that Government?

I believe that we in the Defense Department have not only a moral obligation, but an opportunity to contribute far more to the social needs of our country than we have ever done before.

Accordingly, I have today directed

the Secretaries of the Army, Navy and Air Force, the Director of Research and Engineering, and the Assistant Secretaries of Defense to address themselves to this challenge.

I have asked that they provide me their proposals on how we may assist in alleviating some of our most pressing domestic problems and how DOD should best organize itself for this purpose.

I am asking for their recommendations by November 30 so that an initial concept can be offered to the new Administration in January.

This effort cannot be successful if we in the Pentagon attempt to implement it ourselves.

The Defense Department can and must work with industry, with labor, and with our great scientific and educational communities. And, of course, we shall need the understanding and support of the Congress.

The proven techniques and skills and resources of industry, combined with the proven organization and discipline of the Defense Department, can be utilized together far more effectively than heretofore for the benefit of our nation.

I believe we can do it.

I believe we must do it.

There will be those who will argue that the Defense Department is not a social welfare institution, and who will contend that it has no business interfering in the internal welfare of our country.

I have no intention of turning the Defense Department into something it should not be.

Of course, I do not regard the Defense Department primarily as an instrument of social welfare.

Of course, I do not believe that the Department should take over the responsibilities of other governmental or private agencies.

Nothing that I propose tonight, nor anything that I will propose so long as I hold this office, will be permitted to interfere with the performance of our historic mission to defend our nation.

But I do believe that the citizens of the United States have reason to expect—and indeed to demand—that the element of Government, which spends half of their Federal tax dollars, devote more of its time and more of its thinking and more of its resources to those aspects of our domestic problems which are impor-

tant to our total national security.

Some might ask this question: "Are you attempting to say that a defense contract should consider not only whether the best weapon can be purchased for the cheapest price, but also whether the measurement of social utility should be included in the contract award decision?"

I am not making such a statement tonight. I do not yet know whether this would be a wise course or what changes in the present law should be considered.

But I do know that there are major areas of concern to our total national security in which the Defense Department—working with industry—can do more. Jobs are a matter of concern. So is education. So are housing, and health and hospital care.

I offer these only as examples of areas in which the Defense Department can be of greater assistance to the nation. The first preliminary steps have been taken by the Department in each. Sometimes they have been taken timidly as though the Defense Department were involving itself in something in which it really had no business.

Housing, hospitals, schools, and employment facilities for the unskilled normally do not possess enough capital resources to make an investment in innovation. They have little or no funds for research and development.

Housing

The average private-sector homebuilder throughout the nation constructs no more than 50 units a year. The average contractor cannot afford research and development into raw materials, advanced design, and better production techniques. He is faced with a small local market, he is enmeshed in a tangle of local building regulations, and he has a high per-unit cost which is reflected in his prices.

No wonder that low-income housing is so unattractive to private enterprise. There are not enough incentives to justify an entrepreneur risking his limited capital.

Every major city in the nation is faced with a serious slum problem which, in turn, leads to destructive social and family problems. Furthermore, slums perpetuate themselves. With minimal maintenance costs and

inflated rents, owners have little financial motive to tear down their antiquated structures and replace them with decent housing.

This can and must be reversed.

What is clearly needed are new materials and new production techniques that will make low-income housing a profitable enterprise.

I suggest that is precisely where the Defense Department can, and must be, innovative and helpful.

The Department is the nation's biggest single user of housing. We currently spend some \$200 million a year in new construction, plus another \$450 million a year for maintenance and operation, debt servicing, and leasing of existing military housing. But of this \$650 million annually, we have been spending virtually nothing for improvement of materials or better construction techniques.

We have begun to remedy the situation by awarding three contracts to explore whether we can lower the cost of military housing, while retaining quality standards. First reports suggest that savings of 15 percent or better may be realized through modular design, adoption of factory assembly methods, and volume procurement.

We are now at a stage where, with the support of Congress, we will design a prototype project and build it at George AFB, Calif. It will be watched with care and evaluated by both DOD and the Department of Housing and Urban Development.

Should this project turn out as we hope, we will have better military housing at lower cost, higher morale and thus improved military effectiveness. These innovations, passed along to the private economy, should have a beneficial impact on the low-income housing problem in our cities.

This beginning illustrates what can be done by the application of the techniques of a DOD effort to a major domestic problem. I ask members of this association to consider how your company can apply its Defense-gained skills to our national housing problems.

Housing needs help; so do hospitals. Costs are soaring—and for the understandable reason that 70 percent of hospital operating costs are wages.

Industry clearly can increase the application of its problem-solving resources to hospital design, construc-

tion and maintenance, and to automated record-keeping, laboratory analysis, and routine diagnostic services.

Hospital Design

This again calls for a significant research and development effort.

It is an effort generally beyond the scope of a city, county, or church group that builds a new hospital. Hospital design and construction are tradition-ridden. There is a great potential for major labor-saving, cost-cutting improvements in hospital equipment. But the local group which builds a hospital is almost always pressed for funds. It is compelled to use the "low-initial-cost" approach.

This results not in lower health-service cost. It builds in the absolute certainty that costs are going to mount.

Surely there is something we can do. The Defense Department is one of the world's largest hospital customers. There is every reason to believe that the cooperative approach of industry and the Department can be applied to hospital construction in the same manner that it is applied to the development and procurement of the complex intercontinental ballistic missile.

Therefore, I intend to proceed with a plan developed within DOD whereby we shall solicit industry for proposals for a whole new generation of hospitals—hospitals so automated that labor costs can be cut drastically, and routine services transferred from the overworked doctor and nurse to the sophisticated machine.

This will result in better, more accurate, and less costly hospital management for the Military Services. Even more significantly, it can point the way to better health care for our citizenry.

Education and Training

Let me now turn to schools and education.

We are far from the optimum development of our educational resources. The blunt fact is that we have focused much of the new technology in education on the exceptional student. For the average or below average youngster, education has been scarcely affected by the scientific revolution since World War II. Educators now say that traditional classroom procedures are not only ineffi-

cient but, in some cases, actually impede the average child's will to learn. If this is true of the student from middle-class America, we must acknowledge how badly we serve the child from the rural slum or the city ghetto, whatever his intellectual endowment may be. Much needs to be done.

The Defense Department can be, and to a degree has already begun to be, a trail blazer in the improvement of education. My predecessor, Robert S. McNamara, began the imaginative Project 100,000. He directed that the Armed Services admit to basic training a limited number of men who, under strict earlier regulations, would have been below military entrance requirements. He was convinced that these men, with the benefit of new teaching methods, would learn to do their military jobs satisfactorily. His confidence was justified. Project 100,000 has been a spectacular success. Of the men who entered during the first year of the program, over 90 percent are now performing effectively on active duty.

The Defense Department is one of the world's largest educators, and should be one of the world's best. We train military people in 1,500 separate skills, and our schools for Service children are in 28 countries around the globe.

The training obtained during military service has been for many Americans the open sesame to a fuller life. Now and for the indefinite future, millions more must serve to guard our country against external threats to its security. We can serve them and add immeasurably to that security by seeing to it that they leave military service equipped to accept a larger share of the problems and the rewards of American society.

I know that many of the companies represented here tonight have already entered the education field and have been working with us. I am aware of some promising work but we have just begun to explore the many useful ways for cooperation between industry and the Military Services. I am convinced, as I hope you are, that continued collaboration will not only help us do our job better, but that it can be the catalyst for improving school systems throughout the country.

Finally, I come to the problem of employment.

The National Alliance of Businessmen, launched last January as the result of President Johnson's vigorous efforts, has proved that there can be a workable relationship between the Federal Government and private industry in putting to work so-called unemployables from the heart of 50 of the nation's ghettos.

There is a real potential for defense industry to bring enterprise to the ghetto. There are already encouraging examples of what can be done, such as in the Watts area of Los Angeles and the Roxbury area of Boston. More than 50 of our major defense contractors have launched specific projects.

I want to see this sort of effort expanded.

Unemployment Problems

As a further step, I have directed today certain changes in the Armed Services Procurement Regulation [see article, "ASPR Changes Expand Emphasis on Labor Surplus Areas," following]. The effect of these changes will be to encourage our major contractors to give greater attention to the possibility of locating new facilities in or near labor surplus areas, and to give more consideration to placing subcontracts in these areas. Through these changes in the regulation, I want to spotlight a responsibility, shared by the Defense Department and its major contractors, to contribute, wherever practical, to solving the problems of hard-core unemployment.

By law, we cannot award contracts on a sole source basis nor pay a price premium to relieve economic dislocation. This means we are forbidden from setting aside complete procurements for award exclusively to firms in labor surplus areas. We cannot award a contract without competition, regardless of the significant contribution such a contract might make to the hard-core unemployment program and the total national interest. I believe the time has come to reexamine this legislative policy.

With the approval of President Johnson, who has given so much of himself to the solution of problems of human rights and human suffering, I intend to join with the Secretaries of Labor and Commerce to determine whether there are still other ways in which the Defense Department and industry can join together in attack-

ing the problems of hard-core unemployment in our society.

Let there be no doubt as to my strong feeling that the Defense Department has the opportunity and the responsibility to make a greater contribution to the social needs of the country, for it is my certain conviction that such action will contribute to our total national strength.

Not too many years ago, the War and Navy Departments were concerned almost exclusively with men and simple machines. Defense industries were regarded as mere munitions makers. How remote that era seems!

We now have a military-industrial team with unique resources of experience, engineering talent, management and problem-solving capacities, a team that must be used to help find the answers to complex domestic

problems as it has found the answers to complex weapon systems. Those answers can be put to good use by our cities and our states, by our schools, by large and small business alike. The nation will be the better and the stronger.

I have no illusions that the tasks we have been discussing are simple, or that they can be accomplished overnight. The problems are many, and they will be with us for too long a time. But I am confident that the defense industries and the Defense Department can, while providing "for the common defence," also "promote the general Welfare" and make even more meaningful "the Blessings of Liberty to ourselves and our Posterity."

To this end, I bespeak your cooperation.

I pledge you mine.

ASPR Changes Expand Emphasis on Labor Surplus Areas

The Armed Services Procurement Regulation (ASPR) has been changed to reflect DOD's increased emphasis on allocating defense business to areas of concentrated unemployment or underemployment, when possible.

Until the changes can be published in a forthcoming Defense Procurement Circular, Assistant Secretary of Defense (Installations and Logistics) Thomas D. Morris provided the Military Departments and the Defense Supply Agency with advanced copies, so those agencies can promptly put the changes into effect.

Revision to ASPR 1-704.3 adds the following new paragraph:

(xi) He shall through Departmental channels bring to the attention of the Director for Small Business and Economic Utilization Policy possible contracting opportunities or the establishment of new facilities in or near sections of concentrated unemployment or underemployment and areas of persistent or substantial labor surplus.

This approved revision requires small business specialists to review all procurements for possible contracting opportunities or opportunities to establish new facilities in or near sections of concentrated unemploy-

ment or underemployment and persistent or substantial labor surplus areas. This revision also requires that these opportunities be brought to the attention of the Director of Small Business and Economic Utilization Policy in the Office of the Assistant Secretary of Defense (Installations and Logistics).

Revision to ASPR 1-2100.1 adds the following new paragraph:

(c) The development of the AP (advance procurement) plan covering the contractual plan shall include a best effort to plan for the use and establishment of necessary facilities in or near sections of concentrated unemployment or underemployment and areas of persistent or substantial labor surplus.

Revision to ASPR 3-902.1 adds the following new paragraph:

In reviewing the content of the proposed make-or-buy program, effort should be made to have the prime contractor establish any new facility in or near sections of concentrated unemployment or underemployment and in areas of persistent or substantial labor surplus.

(Continued on page 18)

Revision to ASPR 3-902.3(a) adds the following new paragraph:

After considering such factors as capability, capacity, availability or small business and labor surplus area concerns as subcontract sources, the establishment of new facilities in or near sections of concentrated unemployment or underemployment, contract schedules, integrated control, . . .

The approved revision to ASPR 3-902.3(a) adds an additional special factor that contracting officers must take into account when considering a contractor's make-or-buy program. In addition to such factors as capability, capacity and availability of small business and labor surplus area concerns as subcontract sources, contracting officers shall also consider establishment of new facilities in or near sections of concentrated unemployment or underemployment.

Revision to ASPR 3-902.3(a)(v) adds the following phrase:

Whether the facility is in or near section of concentrated unemployment or underemployment.

Prospective contractors were required to recommend whether to make or buy each item, proposed subcontractors, if known, including location, and designation of plants in which the contractor proposes to make the item. The approved revision provides that a prospective contractor must also indicate whether his production facility is located in or near a section of unemployment or underemployment.

Revision to ASPR 23-202(a) adds the following new paragraph:

Whether consideration was given to the solicitation of small business and labor surplus area subcontract sources.

Current regulations require contractors, under certain conditions, to obtain the contracting officer's advance approval to enter a subcontract. The regulation requires the contracting officer to review the factors used as the basis for selecting subcontractors. The approved revision to the regulation now requires the contracting officer to consider whether the prime contractor gave consideration to soliciting small business or labor surplus area subcontract sources.

The Secretary of Defense has approved these revisions to the ASPR and has directed that they be put into practice as soon as possible.

Sentinel ABM Production, Development Contracts Signed

The U.S. Army has signed two contracts totaling more than \$475 million in value with Western Electric Co. for continued development and production work on the Sentinel Ballistic Missile Defense System.

Included in the contracts were funds for manufacturing the hardware to be installed at the first Sentinel operational sites, production management services, manufacturing and test engineering, and systems integration work.

The contracts include \$273,171,000 for continued research and development on the system and \$202,375,319 for production.

Western Electric officials said the company expects to subcontract more than 60 percent of both contracts to other firms. More than 3,000 companies are involved in the Sentinel program as subcontractors and suppliers of various goods and services.

The research and development contract includes funds for a prototype model of the long-range perimeter acquisition radar which will be constructed at the first Sentinel site near Boston, Mass.

The production contract includes funds for manufacture and procurement of components to be used in the Boston Missile Site radar. The prototype of this radar was built at the Kwajalein Missile Site in the Pacific.

Other components of the system which will be funded under both contracts are the high speed computers for the system and the long-range Spartan and short-range Sprint interceptor missiles.

Major subcontractors on the system and the approximate amounts planned for their efforts are:

General Electric Co., Syracuse, N.Y., Perimeter Acquisition Radar, \$50,000,000 for R&D and \$8,000,000 for production.

Raytheon Co., Wayland, Bedford, Andover and Waltham, Mass., Missile Site Radar, \$10,000,000 for R&D and \$50,000,000 for production.

McDonnell Douglas Corp., Santa Monica and Torrance, Calif., and St. Louis, Mo., Spartan Missile, \$40,000,000 for R&D and \$15,000,000 for production.

Martin Marietta Corp., Orlando, Fla., Sprint Missile, \$30,000,000 for

R&D and \$5,000,000 for production.

Lockheed Electronics Co., Los Angeles, Calif., computer equipment, \$2,000,000 for R&D and \$1,000,000 for production.

Radio Corporation of America, Harrison, N.J.; Texas Instruments Co., Dallas, Tex.; and Motorola Corp., Phoenix, Ariz., integrated circuit packages, each \$9,000,000 in production funds.

Sperry Rand Corp., UNIVAC Div., St. Paul, Minn., computer program development, \$1,000,000 in R&D funds.

Western Electric will perform the major part of its work at Greensboro, Burlington, and Winston-Salem, N.C., and Allentown, Pa. Bell Telephone Labs, a Western associate responsible for system technical design and development, performs its Sentinel operations at Whippany, N.J.

Lieutenant General Alfred D. Starbird, is Sentinel System Manager with headquarters in Alexandria, Va.

The development and production contracts were negotiated and signed with Western Electric by the Sentinel System Command, headed by Brigadier General I. O. Drewry. The command is responsible for managing the Sentinel development and production program for the system manager.

Lightning Subject of Symposium Dec. 3-5

The use and application of lightning and static-electricity protection techniques will be the subject of a three-day symposium to begin Dec. 3 at the Deauville Hotel, in Miami Beach, Fla.

Areas of concentration for the conference include: general aspects of lightning and static-electricity; fluids and fuels and special problems; grounding and bonding for flight vehicles; and non-conductive, non-metallic structural materials.

Sponsors of the symposium are the Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio, and the Society of Automotive Engineers.

G. R. Austin of the Electronic Warfare Division, Air Force Avionics Laboratory, is symposium chairman.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Dr. Laurence E. Lynn Jr. has been sworn in as Dep. Asst. Secretary of Defense (Economic & Resource Analysis), in the Office of the Asst. Secretary of Defense (Systems Analysis).

Dr. Robert A. Huggins has succeeded Dr. Robb M. Thomson as Dir., Materials Sciences Office, Advanced Research Projects Agency.

C. Robert Wieser has assumed duties as Asst. Dir. (Defensive Systems), Office of the Dir., Defense Research & Engineering. He succeeds Charles S. Lerch Jr.

Col. Sherman R. Cummings, USAF, has been assigned as Chief of the Commercial Policy Div., Defense Communications Agency.

DEPARTMENT OF THE ARMY

T. Arthur Smith has been appointed Dir. of Cost Analysis, Office of the Comptroller of the Army.

Brig. Gen. George H. McBride has been named Dep. Commanding General, Air Defense Systems, at the Army Missile Command, Huntsville, Ala. He succeeds Brig. Gen. Clarence C. Harvey Jr. who has retired.

Col. James W. Ryan, who heads the Army's Research and Industrial Liaison Office at the Combat Developments Command, Fort Belvoir, Va., was promoted to his present rank Aug. 23.

The Institute of Systems Analysis at the Combat Developments Command, Fort Belvoir, Va., has appointed Dr. Marion Bryson as its new Technical Director.

DEPARTMENT OF THE NAVY

RAdm. Kenneth L. Veth, Commander, U.S. Naval Forces, Vietnam, will be the next Commandant, Fourth Naval Dist. RAdm. Robert H. Speck, who has been commandant since 1965, is retiring after 45 years active duty.

Capt. Charles B. Bishop has been selected as Commanding Officer of the Navy Underwater Sea Warfare

Center, San Diego, Calif.

Capt. Vincent A. Lascara has relieved RAdm. Douglas H. Lyness as Commanding Officer, Fleet Material Support Office, Mechanicsburg, Pa. Adm. Lyness, who was recently advanced to flag rank, has been assigned duty as Commanding Officer, Navy Ships Store Office, Brooklyn, N.Y.

Capt. Paul K. Trahan will become Public Affairs Officer for the Naval Material Command on Nov. 1. He succeeds Capt. Bernard S. Solomon who is retiring from the Navy.

Capt. Justin A. O'Neil has assumed command of the Naval Avionics Facility, Indianapolis, Ind.

DEPARTMENT OF THE AIR FORCE

The following assignments have been made at Aeronautical Systems Div., Air Force Systems Command: Col. Emerson B. Blair, Dir., Crew and AGE Subsystems Engineering; Col. Paul L. Deimling, Chief, Technical Requirements and Standards Office; Col. Lloyd M. N. Wenzel, Dep. System Program Dir., F-X System Program Office; Col. Howard H. Wittrock, Asst. Dep., Systems Manage-

ment; and Col. Lawrence C. Wright, Dir., Precision Weapons Delivery.

Col. Eugene Finke has been reassigned as Dir. of Research Programs, Office of Aerospace Research.

Col. Robert L. Jones is the new Chief, Electronic Data Processing Equipment Office, Electronic Systems Div., Air Force Systems Command.

Col. Robert Muldrow has been named as the new Dep. Commander, Deseret Test Center, Fort Douglas, Utah.

The Air Force Missile Development Center, Holloman AFB, N.M., announces the following assignments: Col. James C. Manatt, Vice Commander; William J. Laubendorfer, Chief Scientist; and Lt. Col. William C. McCormick, Dir., Technical Support.

New assignments at the Space and Missile Systems Organization, Air Force Systems Command, Los Angeles, Calif., include: Col. Quentin J. Goss, Dir. of Technology; Col. Walter R. Taliaferro, Dep. for Launch Vehicles; Col. William J. Henderson, Dir., Titan III System Program Office, and Lt. Col. Fred W. Seybold, Dir., Vela Satellite Program Office.

Oceanographic Research Cruise Schedules Announced

The latest edition of "Oceanographic Ship Operating Schedules," published for the National Council on Marine Resources and Engineering Development by the council's Committee on Marine Research, Education, and Facilities, is now available.

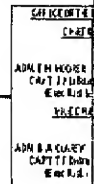
The 50-page pamphlet lists approximately 80 government-owned or sponsored ships which will participate in the national oceanographic program during the coming year.

Each ship listing includes expected cruise periods, geographic area of planned operation, type of work to be performed, and number of visiting scientists that can be accommodated.

Scientists interested in applying for available berths aboard oceanographic ships should apply directly to the agency or institution sponsoring the vessel. This information is included in the Operating Schedule.

Research data gathered during the cruises may be obtained from the National Oceanographic Data Center, U.S. Naval Station, Navy Yard Annex, Washington, D.C. 20390.

Single copies of the Oceanographic Ship Operating Schedules are available without charge from the Committee on Marine Research, Education, and Facilities, Building 159E, Room 476, Washington Navy Yard, Washington, D.C. 20390.





GOVERNMENT PRINTING OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Defense Communications System Engineering-Installation Standards Manual, Annex A, Television System and Equipment Standards. Establishes standards for high quality closed circuit TV systems and associated equipment, applicable to all elements of the Defense Communications Agency in the design and installation of command and control TV systems. 1967. 508 p. il. D5.104:330-175-1/Annex A. \$3.

Design Manuals. This series presents the criteria that shall be used in the design of facilities under the cognizance of the Naval Facilities Engineering Command:

Cold Regions Engineering. Basic requirements for naval shore facilities. 1968. 184 p. il. D209.14/2:9. \$1.75.

Research, Development, and Test Facilities. Contains design criteria for buildings specifically designed for research, development and test at naval shore activities, and criteria of a general nature for the designing of launch pads, camera pads and telemetry. 1968. 33 p. il. D209.14/2:31/2. 25¢

Changes 1 to NavFac DM 6, 22, 24, 33, and 35. Contains all changes to Design Manuals that were made during the period of July 1966-Dec. 1967. 1968. 149 p. D209.14/2:6-35/ch.1. \$1.25.

How to Obtain Consideration for Architect-Engineer Contracts with DOD. Provides information and guidance in connection with the design of military public works projects. Outlines basic policies established by DOD governing the selection of architect-engineers, and describes procedures for obtaining consideration

for architect-engineer contracts. Rev. 1968. 28 p. il. D7.6/4:Ar2/968. 15¢.

Industrial Plant Equipment Handbook, FSC 6625, Electrical and Electronic Properties Measuring and Testing Instruments. Contains standards for describing DOD-owned electrical and electronic properties measuring and testing instruments which have been identified as industrial plant equipment by the Defense Supply Agency. Rev. 1968. 794 p. D7.6/7:4215 1/2. \$3.75.

Oceanography 1967, Annual Report Naval Oceanographic Office. Provides a brief summary of the programs and efforts of the Naval Oceanographic Office. 1968. 75 p. il. pl D203.1:1967. 45¢.

Changes to MILSTRIP Assistance Program Address Directory, Supplement No. 2, Nov. 1, 1967, as Amended. Change No. 15, June 1, 1968. 1968. 129 p. D7.6/4:M59/supp.2/rev./ch. 15. 65¢. Change No. 16, May 15, 1968. 1968. 11 p. D7.6/4:M59/supp.2/rev./ch.16. 10¢.

Research Reports

Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche copies (65¢) or full-size copies (\$3) of the documents (unless otherwise indicated) from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

List of DDC Users (Domestic Users Only). Defense Documentation Center, Alexandria, Va., July 1968, 435 p. Order No. AD-667 100.

Cost/Benefits of Technical Information Services and Technology Transfer. Defense Documentation Center, Alexandria, Va., July 1968, 297 p. Order No. AD-672 500.

Angular Distribution of Radiation Reflected from Carbon Dioxide Cryodeposits Formed on 77°K Surfaces. Thermal Radiation Section, ARO, Inc., Arnold Air Force Station, Tenn., for the Air Force 1968, 63 p. Order No. AD-668 432.

Tests and Investigations of a High Speed Towed Sonar Cable, Final Report. Boeing Co., Seattle, Wash., for the Navy, June 1966, 340 p. Order No. AD-822 939.

High Speed Harmonic Drive Speed Reducer. United Shoe Machinery Corp., Beverly, Mass., for the Army, Jan. 1968, 36 p. Order No. AD-667 383.

Solar Cell Power Systems for APL Satellites. Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Md., for the Navy, Feb. 1968, 33 p. Order No. AD-668 144.

Effectiveness of an Inertial Air Cleaner in Extending Gas Turbine Life in a Dusty Environment. Southwest Research Institute, San Antonio, Tex., for the Army, March 1968, 58 p. Order No. AD-668 258.

Mechanochemistry of Coupled Contractile and Chemical Rate Processes. Weizmann Institute of Science, Rehovoth, Israel, for the Air Force, May 1968, 119 p. Order No. AD-668 557.

Standard Alkaline Cells and Secondary Batteries. Army Electronics Command, Fort Monmouth, N.J., March 1968, 31 p. Order No. AD-668 654.

Pictorial Sonar Demonstration Model Program. Sperry Rand Corp., for the Navy, Feb. 1968, 65 p. Order No. AD-667 832.

Finite Difference Solutions of the Acoustic Radiation Equation in the Near Field. University of Houston, for the Navy, Sept. 1967, 55 p. Order No. AD-666 960.

Production and Measurement of Ultrasonic Surface Waves. Georgetown University, for the Navy, March 1968, 37 p. Order No. AD-667 591.

Some Experiments with a Liquid Filled Acoustic Resonator Showing the Existence of Stable Bubbles in Water. Naval Research Lab., Washington, D.C., July 1967, 10 p. Order No. AD-667 585.

Standardization Documents Available from Single DOD Distribution Point

David Shapiro

Specifications and standards for items used by the Military Services are important documents to private industry bidding on or performing on a defense contract. These documents can be obtained from a single DOD point of distribution—the U. S. Naval Publications and Forms Center (formerly the Naval Supply Depot), 5801 Tabor Ave., Philadelphia, Pa. 19120.

Some of the types of standardization documents stocked and distributed by the Naval Publications and Forms Center (NPFC) at Philadelphia are:

- Military Specifications.
- Federal Specifications.
- Qualified Products Lists.
- U.S. Air Force Specifications.
- Air Force-Navy Aeronautical Bulletins.
- Military Standards.
- Federal Standards.
- Military Handbooks.
- Air Force-Navy Aeronautical Standards.
- Air Force-Navy Aeronautical Specifications.
- U. S. Air Force Specification Bulletins.

NPFC Philadelphia stocks 65,000 of these items, processes 2,500 requests daily for 13,000 line items, and receives 75 new items daily. Its customers are industrial firms; all Military Services; Federal, state and municipal agencies; and friendly foreign governments. Customer requests are generally filled within 16 working hours provided the material is on the shelf.

How To Request Standardization Documents

While specifications and standards can be ordered by letter, telegraph, telephone, or personal visit, the preferred and most expeditious method is the use of the simplified order DD Form 1425 which includes a self-

addressed label. Once a customer orders specifications and standards by this method, he will automatically be provided with sufficient blank Form 1425s by NPFC Philadelphia to reorder in the preferred manner.

All types of requests should furnish the following information:

- Complete mailing address and number of invitation for bid or contract, where applicable.
- Listing of each desired document by symbol as recorded in the Department of Defense Index of Specifications and Standards (DODISS). (The DODISS is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, at an annual subscription rate of \$20.)
- Listing of Federal specifications in alphabetical order and all others in numerical order. (The following sequence of categories of material is preferred: Qualified Products Lists, Federal Specifications, Federal Standards, Military Specifications, Military Sheet Form Standards, Air Force-Navy Standards, and Military Book Form Standards.)

Each request should limit the number of documents ordered to five or less.

Requests by telephone may be made by calling (215) 697-3321. Duty hours at NPFC Philadelphia are 8:00 a.m. to 4:30 p.m., Monday through Friday. Off-duty telephone requests are serviced by an automatic answering device seven days a week.

Subscription Service for New or Revised Releases

In order to provide maximum responsiveness to industry requirements, new or revised releases of those Military and Federal Specifications and Standards (including Qualified Products Lists), which are to be listed in the Department of Defense Index of Specifications and Stand-

ards, are available to industry on a subscription basis with automatic mailing upon payment of fees.

Subscriptions will be accepted on a Federal Supply Classification basis for a single class, or for as many individual classes as the subscriber chooses. Available classes are listed according to subject, e.g., Class 4710—Pipe and Tube, in the Cataloging Handbook H2-1 which can be obtained without charge from the Director, Navy Publications and Printing Service Office, 700 Robbins Ave., Philadelphia, Pa. 19111.

An annual service fee of \$4.50 for each class will apply without regard to the number of documents which may be issued within the class. This fee is required to defray the administrative expense of screening and distributing releases. Subscription to this service does not relieve contrac-

(Continued inside back cover)



David Shapiro has been Dep. Dir., of the Planning and Comptroller Department, Naval Publications and Forms Center, Philadelphia, Pa., for seven years. Previously, he was a Management Analysis Officer, Aviation Supply Office. He is a retired commander, USNR. He holds a masters degree in mathematics from Temple University.

Guidelines for Developing and Submitting Unsolicited Proposals

In its continuing search for new and imaginative ideas, Air Force Systems Command (AFSC) attempts to explore every potential resource, including the unsolicited proposal. In order to use to the fullest extent, the vast supply of intellectual resources available in the United States, AFSC encourages organizations or individuals outside the Air Force to suggest research and development ideas.

During FY 1968, AFSC evaluated 2,094 unsolicited proposals. Of this number, 459, or 21.9 percent, were accepted and funded at a cost to the Air Force of \$119,154,817.

Voluntary proposals to perform research and development, unlike proposals which are requested by Air Force procurement activities from qualified sources, must be specially funded if adopted. Therefore, it is mandatory that the voluntary proposal be evaluated as offering significant advancement in the present state of the art before consideration for support by the Air Force can be given.

Advance Consultations

The Air Force Systems Command gives advance opinion on all proposed research and development efforts voluntarily suggested by organizations and individuals outside the Air Force. This opinion guides the submitter prior to the start of any extensive effort in the development of a detailed unsolicited proposal and is based on the assumption that there is a valid Air Force need for the suggested work. Prior personal contact with Air Force technical personnel, while not required, is permissible and encouraged. (All AFSC organizations, including names of individual contacts and the areas of interest of each organization, are listed at the end of this article.)

Proprietary Rights and Information

Unsolicited proposals do not necessarily contain proprietary information. They may be unique unto themselves, or may be no more than a restatement of existing Air Force requirements and, as such, should not be considered proprietary. Unsolicited proposals, which truly contain proprietary data, should have every paragraph revealing such data clearly marked "Proprietary Information" at the beginning and end of each paragraph.

When and How To Submit

Research and development proposals may be submitted at any time. An idea which is original in nature and concept, and which falls within the Air Force areas of interest may be submitted voluntarily.

While no rigid format is specified, elaborate brochures or presentations are definitely not desired. The best way to inform the Air Force Systems Command agencies of proposed efforts, and to determine if it has a potential usefulness to the Air Force, is by letter. The ABCs of successful proposals are accuracy, brevity and clarity. It is extremely important that the letter be prepared with great care so that it is easily read and easily understood. Specifically, the letter should include the following:

- Name and address of the organization.
- Type of organization (profit, non-profit).
- Concise title and abstract of the proposed research.
- An outline and discussion of the purpose of the research, the method of attack upon the problem, and the nature of the expected results.
- Name and research experience of the principal investigator.

- A suggestion as to the proposed starting and completion dates.
- An outline of the proposed budget, including information on equipment, facility, and personnel requirements.
- Names of any other Federal Agencies receiving the proposal. (This is extremely important.)
- Brief description of the facilities, particularly those which would be used in the proposed research effort.
- Brief outline of previous work and experience in the field.
- If available, a descriptive brochure and a financial statement should be included.

AFSC Form 91—Policy Agreement

AFSC Form 91, titled "Policy Agreement for Evaluation by the AFSC of Unsolicited Articles, Disclosures, Inventions, and Voluntary Proposals for Contract," is a statement of the terms under which the Air Force Systems Command will accept voluntary unsolicited proposals. This agreement must be signed by an officer of the company or the individual owning the intellectual property contained in the voluntary proposal prior to evaluation. It is designed for the mutual protection of all concerned and provides protection based on proprietary claims made by submitters of voluntary proposals.

No request for special exception or changes in the policy agreement will be granted. This agreement is to be executed only once (in duplicate) at the time of initial proposal submission. All subsequent proposal submissions will be covered by the executed Policy Agreement.

The Policy Agreement form is available from any AFSC office listed at the end of this article.

Evaluation

AFSC agencies are responsible for acknowledging receipt of unsolicited proposals. Unsolicited proposals will be thoroughly and completely evaluated by appropriate personnel engaged in the technical areas of effort similar to the unsolicited proposal under consideration. Results of the evaluation will be furnished to the submitter.

Arranging a Contract

The Air Force usually funds only those unsolicited proposals evaluated as offering significant advancement in the state of the art. If the unsolicited proposal is accepted, a contract may be negotiated between the organization and the appropriate AFSC activities. Contract details will be discussed and worked out between the submitter and the procurement activity of the AFSC activity concerned. In the event the proposal is not accepted, the Government is not obligated in any way to reimburse the submitter for any costs which may have been incurred in submitting the unsolicited proposal.

AFSC Unsolicited Proposal

Focal Points

Headquarters, Air Force Systems Command (SCKPR)
Andrews AFB,
Washington, D.C. 20331
Phone: (301) 981-4531 or 981-4543
Mrs. Ann P. Wendt or
Mr. Seymour Milnovsky

Air Force Materials Laboratory (MAO-2)
Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 53635
Mr. Sam Bakanauskas

Conducts research and development in areas of analytical chemistry, advanced metallurgy, ceramics and graphite, mechanics, coatings, fluids and lubricants, polymers, fibrous materials, plastics, composites, and elastomers.

Air Force Flight Dynamics Laboratory (FDE)
Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 54316
Mrs. Elsie Goodman

Plans, formulates, presents and executes the AFSC exploratory and advanced development program in the

areas of flight vehicle dynamics, structures, aerodynamics, aerothermodynamics, performance, stability, control, control displays and crew station, environmental control, aerodynamics decelerators and crew escape, alighting and orbital attachment, airframe and equipment bearings, and associated areas, including experimental simulation and flight testing techniques.

Air Force Avionics Laboratory (AVS)
Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 53919

Mrs. Anna Jackson
Plans and executes exploratory and advanced development programs for bionics, lasers, and molecular electronics; electromagnetic vehicle environment, camouflage, and antennas; electromagnetic warfare; navigation, guidance, and fire control; aerospaceborne reconnaissance, surveillance and communications. Provides technical or management assistance in support of studies, analyses, development planning activities, acquisition, test, evaluation, modification, and operation of aerospace systems and related equipment.

Air Force Aero-Propulsion Laboratory (APO-1)
Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 52131

Mr. R. B. Craig
Conducts exploratory and advanced development in air breathing propulsion systems, electronic propulsion, power generation (exclusive of propulsive power), space site and aerospace ground support, fuels, lubrication and hazards.

Air Force Armament Laboratory (ATP)
Eglin AFB, Fla. 32542
Phone: (904) 882-4629 or 882-4620
Mr. H. H. Dillon

Conducts exploratory, advanced and engineering development programs in non-nuclear and chemical-biological munitions, targets and scorers, ballistics and associated areas.

Air Force Weapons Laboratory (WLPA)
Kirtland AFB, N. M. 87117
Phone: (505) 247-1711, Ext. 3991

Lt. Col. James O. Alderman
Nuclear weapons components, biophysical studies, nuclear power applications, environmental research, non-nuclear space weapons and weapons effects, nuclear weapons effects

research, testing and simulation, civil engineering research, survivability/vulnerability analysis techniques, nuclear safety, nuclear weapon arming and fuzing, nuclear and non-nuclear weapon handling, suspension and release.

Air Force Rocket Propulsion Laboratory (RPPR)
Edwards AFB, Calif. 93523
Phone: (714) 898-1640, Ext. 32537
Mr. D. E. Kistler

Propellant and combustion technology, liquid rocket technology, solid rocket technology, nuclear rocket technology; aerospace ground equipment, and rocket propulsion facility technologies.

Rome Air Development Center (EMPOD)
Griffiss AFB, N. Y. 13440
Phone: (315) 330-3200, Ext. 4427

Mr. R. Cain
Exploratory and advanced technology in areas of high-power microwave components, signal detection and processing, computation and display, reliability and maintainability, command and control, instrumentation and test, and associated areas. Primary program areas include data acquisition, processing and presentation; micro-electronics; human engineering, intelligence and electronic warfare. Research and application of techniques and equipment used in the electromagnetic jamming as well as countermeasures and communications, with a major interest in data transmission and techniques in propagation, detection antennas, and information theory.

Aeronautical Systems Division (ASOP)
Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 52402

Mr. Richard L. Warren
Manages acquisition of aeronautical systems, subsystems and related equipment, including conceptual planning, engineering design, development, test and inventory production. Is the lead AFSC division for limited war, special air warfare, aeronautical reconnaissance, and electronic warfare.

Air Force Human Resources Laboratory (HRO)
Brooks AFB, Tex. 78235
Phone: (512) 536-3605

Major J. E. Wade
Principal organization charged with planning and executing exploratory

and advanced development programs for selection, motivation, training, retention, education, utilization and career development of military personnel; composition of the personnel force; and training equipment. Provides technical and management assistance in support of studies, analyses, development planning activities, acquisition, test, evaluation, modification, and operation of aerospace systems and related equipment.

Aerospace Medical Division (AMRX)
Brooks AFB, Tex. 78235
Phone: (512) 536-3681

Major J. R. Watson
Manages and conducts aerospace medical, behavioral, and bioastronautic research and development, and develops and administers specialized educational programs, bioenvironmental health procedures and clinical medicine.

6571st Aeromedical Research Laboratory (ARGS)

Holloman AFB, N. M. 88330
Phone: (505) 587-1110, Ext. 52236

Dr. H. J. Von Beckh
Prediction of adult reaction to stress, comparative social factors in primates (validation); animal test of life support systems, biophysical measurements, biomagnetics; animal training techniques and equipment, animal performance in hazardous environments.

USAF School of Aerospace Medicine (SMGS)

Brooks AFB, Tex. 78235
Phone: (512) 536-3577

Miss C. L. Reynolds
Physiological tolerance and mechanisms, physiological assessments in flight and simulators, habitable atmospheres, bioregenerative systems, hypogravity states; biological effects of radiation exposure, modification of radiation effects, operational hazards and tolerance, criteria in aerospace environments, biodosimetry; pathophysiological reactions, medical aspects of operational safety, medical implications of biological-chemical operations, preventive and occupational medicine, emergency medicine and evacuation; clinical medicine in aerospace operations; medical selection conditioning and maintenance, medical support operations, medical monitoring.

USAF Epidemiological Laboratory (EPC)

Lackland AFB, Tex. 78236

Phone: (512) 674-3211, Ext. 4248
Lt. Col. Chauncey W. Smith
Epidemiology.

6570th Aerospace Medical Research Laboratory (MRT)

Wright-Patterson AFB, Ohio 45433
Phone: (513) 785-5214 or 785-5227
Mr. E. E. Martin

Prediction and control of human behavior, basic mechanisms of selected physiological functions, fundamental biological data, organization and functions of nervous systems; design criteria of bionics, life support systems, chemoregenerative systems, protective equipment, waste management, nutrition, biomechanics, acceleration; (sustained) impact, vibration, acoustics, weightlessness; toxicology, individual protection and decontamination in bacterial-chemical operations; human engineering, training techniques, simulation techniques, and unusual environments.

Wilford Hall USAF Hospital (WHR)

Lackland AFB, Tex. 78236
Phone: (512) 671-4201

Lt. Col. K. H. Cooper
Clinical investigations, new techniques in medical practice.

Foreign Technology Division (TDKS)

Wright-Patterson AFB, Ohio 45433
Phone: (513) 257-1110, Ext. 70232

Mrs. L. R. Connally
Exposition of foreign innovations from foreign technology, development of detailed understanding of such innovations, and the reduction of this understanding to form useful to U.S. research and development and to DOD.

Space and Missile Systems Organization (SMTO)

Air Force Unit Post Office
Los Angeles, Calif. 90045
Phone: (213) 643-1766

Mr. Thomas A. Caruso
Development and acquisition of operational systems relative to satellites, space vehicles, and boosters required to launch them. Performs research associated with communication, launch services and maintenance of space vehicles. Manages Air Force ballistic missile acquisition programs and DOD programs for advanced ballistic reentry systems. Related responsibilities begin with systems concepts, and include development, production, delivery of operational systems, and site activations.

Electronic Systems Division (EST)

L. G. Hanscom Field
Bedford, Mass. 01731
Phone: (617) 274-6100, Ext. 3582

Mr. M. V. Ratynski
Plans for command and control and communications-electronics systems. It is the lead AFSC division for design and acquisition of systems, related equipment and services for command and control, communications-electronics and range instrumentation. Responsible for systems planning and acquisition in selected functional areas such as detection, surveillance, identification, threat evaluation and warning, weather and intelligence.

Air Force Eastern Test Range (ETES)

Patrick AFB, Fla. 32925
Phone: (305) 485-6525 or 485-7211
Mr. E. C. Allmon

Develops, maintains and operates range. Obtains and coordinates all government and contractor services needed to support DOD, NASA and other agency programs.

Air Force Western Test Range (WTGT)

Vandenberg AFB, Calif. 93437
Phone: (805) 866-1611, Ext. 67077
Mr. Stanley R. Radom

Develops, maintains and operates range. Obtains and coordinates all government and contractor services needed to support DOD, NASA and other agency programs.

Air Force Missile Development Center (MDMKN-4)

Holloman AFB, N.M. 88330
Phone: (505) 473-6511, Ext. 7148
Mrs. W. Louise Holley

Provides test and test support for aircraft missiles, electronic systems, and reconnaissance systems; operates a data computation complex, the AFSC Navigation and Guidance Test Laboratory, and the high-speed test track.

Air Force Missile Development Center (Det. 1) Air Force Avionics Laboratory (AVNI)

Holloman AFB, N.M. 88330
Phone: (505) 473-6511, Ext. 52525
Mrs. Diane K. Kotera

Conducts in-house research and development of inertial navigation systems.

Air Force Flight Test Center (FTOP)

Edwards AFB, Calif. 93523

Phone: (805) 258-2111, Ext. 72146

Mr. Robert W. McLane

Conducts and provides support for tests of aircraft systems, operates the aerospace pilot school, and supports rocket propulsion, laboratory, and testing activities.

Armament Development and Test Center (ADAS)

Eglin AFB, Fla. 32542

Phone: (904) 882-2843

Mr. John V. Leftwich

Engineering development, test, evaluation, initial acquisition and program management of Air Force non-nuclear munitions. Conducts or supports development testing of weapon systems, electronic systems, armament systems, non-nuclear munitions, chemical-biological munitions, electronic countermeasures equipment, targets and scorers, drones, probes and miscellaneous items. Supports development and test of special air warfare tactics, techniques and equipment. The Office of Technical Applications for Southeast Asia identifies technical operational problems that lend themselves to quick-fix solutions. Areas of interest include munitions, avionics, aircraft, communications, surveillance and support.

Air Force Special Weapons Center (SWLPR)

Kirtland AFB, N. M. 87117

Phone: (505) 247-1711, Ext. 2134

Mr. Robert C. Blair

Conducts nuclear weapon compatibility and support equipment tests, nuclear weapons effects simulation tests and analyses to determine the survivability/vulnerability of USAF weapons. Provides aerial support for U.S. underground nuclear test programs and conducts airdrop tests of ballistic shapes. Operates high-performance test aircraft, and effects simulation, physical test, engineering and photographic laboratories, and fabrication shops with machining and microelectronics capabilities.

Arnold Engineering Development Center (AELR)

Arnold AFS, Tenn. 37389

Phone: (615) 455-2611, Ext. 252

Dr. H. K. Doetsch

Development testing in ground test facilities such as hypersonic and hypervelocity wind tunnels, chemical rocket and airbreathing propulsion test facilities, space simulation chambers, and aeroballistic and impact ranges. Continuous updating of present facilities and development of new concepts and technologies for design and construction of advanced facilities. Problem areas in thermodynamics, gasdynamics, chemistry, general physics, combustion, electronics, instrumentation, electrical power generation, all related to development and operation of ground test facilities.

Communications SPOs Reorganized by ESD

The Deputate for Communications Systems of the Electronic Systems Division of the Air Force Systems Command, at L. G. Hanscom Field, Mass., has been reorganized. The Long Lines Communications System Program Office (SPO) and the Secure Communications SPO have been consolidated into a single Transmission and Switching SPO. The new office is headed by Colonel Conrad R. Peterson.

Other changes include the redesignation of the Survivable Communications SPO as the Tactical and Survivable Communications SPO, and the addition of a Special Communications Program Office. The Special Communications Program Office will be responsible for the communications segments of other systems being developed by the Electronics Systems Division.

Colonel John T. Tyler is the Director of the Tactical and Survivable Communications SPO. John A. Kelly is head of the Special Communications Program Office.

DOD Establishes Food Product Evaluation Committee

The Defense Department Directorate for Food Service, as part of its effort to consolidate and standardize common functions of the Armed Forces food programs, has established a Food Product Evaluation Committee.

The committee will evaluate unsolicited foods offered to the military and new items discovered by research and development. It will also try to improve existing foods and food packaging, and will coordinate introduction of new or improved foods.

Functions of the committee do not, however, include foods required by the Service commissaries, exchanges, clubs and recreational activities.

Point of contact for information is:
Chairman

Department of Defense Food Planning Board Product Evaluation Committee

1819 W. Pershing Road
Chicago, Ill. 60609

Dragon Anti-Tank System Enters Production Stage

The Army will soon begin production of the Dragon, an anti-tank weapon system that is fired from the shoulder but is powerful and accurate enough to destroy armor and other field fortifications.

A contract for production engineering and production of the Dragon has been awarded to McDonnell-Douglas Corp., Titusville, Fla.

The contract has a total planned value of \$133 million, which will be funded on an annual basis.

The Dragon guided missile system will be far superior in range, accuracy and lethality to the 90mm recoilless rifle it will replace. Weighing about 27 pounds, it will enable an individual soldier to stop an enemy tank with one shot.

Work to be performed under the contract includes advanced production engineering, engineering services and

hardware production.

Dragon consists of two main items: a round and a tracker. The round comes enclosed in a container which doubles as a carrying case and serves as the recoilless launcher. The tracker contains a telescope, a sensor device and an electronics package.

To fire the Dragon, a soldier looks through the telescopic sight and launches the missile. He only has to keep his sight on the target until it is destroyed. Once the target is knocked out, the tracker is removed and the launcher is discarded. The tracker then can be attached quickly to the next round and the soldier is ready to fire again.

Colonel Kenneth C. Van Auken is Project Manager for the Dragon anti-tank weapon system. The project office is located at the Army Missile Command, Redstone Arsenal, Ala.

1968 Omnibus Act

Authorizes Civil Works Projects

The Omnibus Rivers and Harbors and Flood Control and River Basin Monetary Authorization Act of 1968 authorizes the Army Corps of Engineers to construct, modify, or otherwise participate in the provision of 73 flood control, navigation, water conservation and other water resources projects, having an estimated Federal cost of \$1,200,894,000.

This includes 41 flood control (including multiple-purpose) projects at a cost of \$875,706,000; 31 navigation projects at an estimated Federal cost of \$324,508,000; and one beach erosion project at an estimated Federal cost of \$680,000. The Act authorizes eight surveys for flood control and allied purposes and three surveys in the interest of navigation and beach erosion control.

The Act also provides increased monetary authorizations totaling \$469,000,000 for 13 basin plans. Limits have been placed by previous authorization Acts on the total appropriation which could be made to projects included in these basin plans. Increases are necessary at this time to permit additional appropriations to be made. The increases will permit the appropriation of funds necessary to meet scheduled funding requirements on planning and construction projects through calendar year 1969 in these 13 basin plans.

Listings of new construction and other authorizations with description and estimated Federal cost, where appropriate, follow. Initials before the projects indicate: N (navigation); FC (flood control); BE (beach erosion control); MP (multiple-purpose), and HFC (hurricane flood control).

ALASKA

Kake Harbor. (N) Breakwaters. \$1,760,000.

King Cove Harbor. (N) Channel and anchorage areas. \$522,000.

Sergius and Whitestone Narrows. (N) Deep draft channel. \$3,030,000.

Tanana River at Fairbanks. (FC) Dams, levees and pumping plant. \$111,700,000.

ARKANSAS

Belle Fountain. (FC) Drainage facilities. \$4,638,000.

Crooked Creek at Harrison. (MP) Reservoir and local flood protection. \$2,840,000.

Lake Chicot. (FC) Pumping plant and facilities. \$15,240,000.

St. Francis River Basin. (FC) Modify local cooperation.

CALIFORNIA

Alhambra Creek. (FC) Channel improvement and diversions. \$8,000,000.

Cucamonga Creek. (FC) Debris basins and improvements. \$26,300,000.

Feather River at Chester. (FC) Diversion dam and channel. \$940,000.

Humboldt Harbor and Bay. (N) Channels and anchorage area. \$2,430,000.

Mad River. (MP) Multiple-purpose reservoir. \$38,600,000.

Port Hueneme. (N) Channel and basin dredging. \$1,000,000.

San Diego Harbor. (N) Widen and deepen channels. \$5,360,000.

Sweetwater River. (FC) Channel and highway project. \$4,900,000.

Ventura Marina. (N) Maintenance and improvements. \$1,540,000.

COLORADO

Bear Creek. (MP) Mount Carbon Reservoir. \$32,314,000.

CONNECTICUT

Norwalk River. (FC) Channel improvements. \$2,700,000.

Park River. (FC) Conduits and pumping station. \$30,300,000.

DELAWARE

Delaware Coast. (HFC) Erosion control and hurricane protection. \$5,584,000.

FLORIDA

Brevard County. (BE) Fill placement. \$680,000.

Dade County. (HFC) Erosion control and hurricane protection. \$11,805,000.

Gulf Intracoastal Waterway, St. Marks to Tampa Bay. (N) Widen and deepen 234-mile waterway. \$40,000,000.

Hillsborough Bay. (HFC) Protective barrier. \$9,909,000.

Martin County. (FC) Canals, control structures and pumping station. \$8,072,000.

Miami Harbor. (N) Channel deepening. \$6,476,000.

Water resources, C&S Florida. (FC) Raise Lake Okeechobee and expand water control system. \$58,182,000.

HAWAII

Harbors of refuge. (N) Improve three harbors. \$1,256,000.

Iao Stream. (FC) Channel improvement and debris basin. \$1,660,000.

ILLINOIS

Mississippi River, Cassville, Wis., to Mile 300, Ill. (FC) Levees and associated structures. \$21,300,000.

INDIANA

Cal-Sag Bridges, pt. II. (N) Modify local cooperation. \$33,265,000.

Wabash River. (MP) Four reservoirs and one local protection project. \$50,000,000.

IOWA

Big Sioux, vic. of Sioux City. (FC) Channel improvements. \$2,750,000.

Nishnabotna. (FC) Davids Creek Reservoir. \$2,040,000.

KENTUCKY

Southwest Jefferson County. (FC) Pumping plants and water impoundment. \$19,800,000.

LOUISIANA

Atchafalaya River and Bayous Chene, Boeuf and Black. (N) Channel improvements. \$8,645,000.

Mississippi River—Gulf Outlet and Michoud Canal. (N) Enlarge and deepen waterway. \$1,300,000.

Mississippi River, vic. of Venice. (N) Channel improvements. \$4,520,000.

Red River Waterway. (N) Navigation channel and bank stabilization. \$50,000,000.

MASSACHUSETTS

Fall River Harbor. (N) Channel improvements. \$8,762,000.

Ipswich River. (N) Channel improvements and anchorage areas. \$616,000.

Lower Charles River. (MP) Multiple-purpose reservoir with locks. \$18,620,000.

MICHIGAN

Detroit River, Trenton Channel. *

(N) Extend and improve channel. \$31,300,000.

Forestville Harbor. (N) Breakwaters and improvements. \$538,000.

Tawas Bay Harbor. (N) Breakwater for recreational purposes. \$466,000.

MINNESOTA

South Branch Wild Rice River and Felton Ditch. (FC) Channel improvements. \$1,230,000.

MISSISSIPPI

Pascagoula River. (MP) Tallahala Reservoir. \$16,360,000.

Yazoo River. (N) Channel improvements, lock and increase reservoir storage. \$52,147,000.

MISSOURI

Little Blue River, vic. Kansas City. (MP). Two reservoirs and channel improvements. \$38,492,000.

NEBRASKA

Papillion Creek and Tributaries. (MP). 21 reservoirs. \$26,800,000.

NEW HAMPSHIRE

Connecticut River. (MP) Beaver Brook Reservoir. \$1,185,000.

NEW YORK

Cattaraugus Creek Harbor. (N) Breakwaters, channels, etc. \$1,315,000.

Hamlin Beach State Park. (N) Breakwaters, revetment, etc. \$500,000.

Hempstead Harbor. (N) Construct turning basin & deepen channel. \$703,000.

Port Jefferson. (N) Deep-draft channel. \$2,455,000.

Wilson Harbor. (N) Extend and construct channel. \$198,000.

NORTH CAROLINA

Cape Fear River. (MP) Randleman and Howards Mill Reservoirs. \$31,923,000.

NORTH DAKOTA

Missouri River. (FC) Bank stabilization. \$4,040,000.

OHIO

Licking River. (MP) Utica Reservoir and Newark local protection. \$32,953,000.

RHODE ISLAND

Bristol Harbor. (N) Breakwater. \$873,000.

SOUTH CAROLINA

Cooper River, Charleston Harbor. (N) Diversion and hydroelectric plant. \$35,381,000.

TEXAS

Aquilla Creek watershed. (MP) Multiple-purpose reservoir. \$23,612,000.

Clear Creek. (FC) Channel improvements. \$12,600,000.

Corpus Christi Waterway. (N) Navigation improvements. \$19,042,000.

Mouth of Colorado River. (N) Navigation channel. \$3,000,000.

Navasota River. (MP) Millican and Navasota number two reservoirs. \$119,707,000.

Pecan Bayou. (MP) Pecan Bayou Reservoir, channel improvements and protection to Lake Brownwood dam. \$24,861,000.

Texas City and vicinity. (HFC) Levees and associated structures. \$10,990,000.

UTAH

Salt Lake City Streams. (MP) Little Dell Reservoir. \$22,664,000.

VIRGINIA

Rappahannock River. (MP) Salem Church Reservoir. \$79,500,000.

WASHINGTON

Snohomish River, Everett Harbor. (N) Breakwater for small boat harbor and training dike. \$1,108,000.

WISCONSIN

State Road and Ebner Coulees. (FC) Channel improvements and diversion. \$6,849,000.

Other Authorizations

(Cost figures not available, in most cases, on these projects).

Beach Erosion. (BE) Shoreline erosion appraisal investigation and study.

Cairo, Ill. (FC) Pumping plants and drainage facilities.

Carlyle Reservoir, Ill. (FC) Authorization of royalty payments for mineral rights. Not to exceed \$6,401.16.

Clinton Bridge Commission, Iowa. Grants consent to construct a highway bridge.

Devils Jump Reservoir project, Kentucky and Tennessee. (FC) Directs a joint review of this proposed project by the Departments of Interior and Agriculture and the Corps of Engineers.

Dworshak Dam and Reservoir Project, Idaho. (FC) Provides school facilities.

Fort Pierce, Fla. (BE) Modifies original cost arrangements.

Ironton, Ohio. (FC) Provides for closure structures. \$58,000.

Lake Erie. Land conveyance to City of Buffalo, N.Y.

Libby Reservoir Project, Montana. (FC) Provides for relocation of Montana State Highway 37.

Marmet, W. Va. Modifies terms of original land conveyance.

Mason J. Niblack Levee, Ind. (FC) Provides for pumping facilities to remove interior drainage. \$500,000.

Navigation projects. (N) Prevent or mitigate shores damages resulting from Federal navigation works, limited to \$1,000,000 per project.

Painted Rock Reservoir, Ariz. (FC) Modifies items of local cooperation.

Pat Mayse Reservoir, Tex. (MP) Provides for acquisition of additional lands.

Pecos River, Carlsbad, N.M. (FC) Extends time limit for assurances of local cooperation.

Potomac River, Md. and Va. (N) Authorizes removal of abandoned ships, hulls and pilings. \$175,000.

Streambank erosion. Authorizes streambank erosion study throughout the United States.

Water resource projects. Provides for resettlement of families displaced by water resource projects.

Weber River, Utah. (FC) Extends time limit for assurances of local cooperation.

River and Harbor Projects. (N) Authorizes the Corps to maintain excess depths required and constructed for defense purposes where such waterways also serve essential needs of general commerce.

Navigation Surveys

Back River, Md. (from Chesapeake Bay to Baltimore).

Savannah and Tennessee Rivers, S.C. Lake Superior (between Lake Superior and the Mississippi River).

Flood Control Surveys

Burnett, Crystal, and Scotts Bays and vicinity, Baytown, Tex.

Linville Creek, Caney Creek and Tres Palacios, Tex.

Oso Creek, Tex.

Maddaket, Smith's Point and Broad Creek, Mass.

Streams at or near Spring Mountain Youth Camp, Nev.

Virgin River, Bunkerville, Mesquite and Riverside, Nev.

Cuyahoga River from Upper Kent to Portage Trail, Ohio.

Kalihi Stream, Honolulu, Oahu, Hawaii.

Small Business Share FY 1968 Procurement

Small business received 18.8 percent of the total prime contracts awarded by DOD in FY 1968, compared to 20.6 percent in FY 1967. The major reason for the decline in small business percentage was the change in the product mix of FY 1968 procurement. Contracts for missiles and space systems and for other major hard goods increased significantly, providing limited opportunities for small concerns to participate as prime contractors. The increase in ammunition procurement to support activi-

ties in Southeast Asia was another factor, since a major portion of this procurement is awarded to large contractors operating government-owned plants. The small business average was also adversely affected by a substantial decline in contracts for commercial items, construction, and purchases under \$10,000, an area of procurement which provides the most frequent opportunities for awards to small business firms.

Prime contract awards for research, development, test and evalua-

tion (RDT&E) are included in Table 1, and are shown separately by Military Department in Table 2. Data on subcontract commitments to small business firms, obtained from large business firms which received prime contract awards of \$500,000 or more having substantial subcontracting possibilities, are shown in Table 3.

The statistics in the following tables were compiled by the Directorate for Statistical Services, Office of the Assistant Secretary of Defense (Comptroller).

Small Business Share of Defense Procurement

(Amounts in Thousands)

Type of Firm and Category of Procurement	Fiscal Year 1968 July 1967- June 1968	Fiscal Year 1967 July 1966- June 1967
DEFENSE PROCUREMENT (PRIME CONTRACTS) FROM ALL BUSINESS FIRMS— TOTAL	\$40,804,066	\$40,608,892
Missile and Space Systems	4,732,136	4,833,350
Aircraft	9,470,027	9,677,030
Other Major Hard Goods	12,277,569	11,816,401
Services	3,234,257	2,950,250
Commercial Items, Construction and All Purchases Under \$10,000	9,772,629	11,031,984
Civil Functions	817,448	799,877
DEFENSE PROCUREMENT (PRIME CONTRACTS) FROM SMALL BUSINESS FIRMS—TOTAL	7,583,890	8,360,725
Missile and Space Systems	91,498	99,349
Aircraft	264,463	314,775
Other Major Hard Goods	1,428,873	1,591,249
Services	840,843	821,093
Commercial Items, Construction and All Purchases Under \$10,000	4,642,416	5,246,579
Civil Functions	315,797	287,680
PERCENTAGE OF DEFENSE PRIME CONTRACTS TO SMALL BUSINESS FIRMS— TOTAL	18.8	20.6
Missile and Space Systems	1.9	2.3
Aircraft	2.8	3.3
Other Major Hard Goods	11.6	13.5
Services	26.0	27.8
Commercial Items, Construction and All Purchases Under \$10,000	47.5	47.6
Civil Functions	38.6	36.0

Table 1

Small Business Share of Defense Procurement for Research, Development, Test and Evaluation Work

(Amounts in Thousands)

Type of Firm and Department	Fiscal Year 1968	Fiscal Year 1967
	July 1967- June 1968	July 1966- June 1967
TOTAL	\$5,769,041	\$5,871,889
Army	1,152,754	1,123,624
Navy	1,476,768	1,375,404
Air Force	3,139,519	2,872,861
SMALL FIRMS	195,602	212,545
Army	57,483	55,224
Navy	83,827	97,635
Air Force	54,292	59,686
OTHER FIRMS	5,573,439	5,159,344
Army	1,095,271	1,068,400
Navy	1,392,941	1,277,769
Air Force	3,085,227	2,813,175
SMALL FIRMS AS A PERCENT OF TOTAL	3.4	4.0
Army	5.0	4.9
Navy	5.7	7.1
Air Force	1.7	2.1

Table 2

Small Business Share of Prime Contracts and Subcontracts

(Amounts in Thousands)

	Fiscal Year 1968	Fiscal Year 1967
	July 1967- June 1968	July 1966- June 1967
PRIME CONTRACTS	\$40,304,066	\$40,608,892
Small Business Firms	7,589,890	8,360,725
Percent to Small Business	18.8%	20.6%
SUBCONTRACTS		
Number of Reports from Large Business Firms	879 *	816
Subcontract Commitments by Reporting Large Business Firms	15,207,899 *	15,471,506
Commitments to Small Business Firms	6,484,985 *	6,696,946
Percent to Small Business	42.6 *	43.3

* Preliminary, subject to revision.

Table 3

Department of Defense

Prime Contract Awards by State

Net Value of Military Procurement Actions by Department^a

FISCAL YEAR 1968

(Amounts in Thousands)

STATE	Total		Army	Navy	Air Force	Defense Supply Agency
	Amount	Percent				
TOTAL, U.S. ^b	\$41,241,125		\$12,223,146	\$12,703,851	\$11,482,531	\$4,831,597
NOT DISTRIBUTED BY STATE ^c	8,994,862		1,021,600	1,211,732	948,157	812,873
STATES TOTALS ^d	37,246,763	100.0	11,201,546	11,492,119	10,534,374	4,018,724
Alabama	409,189	1.1	207,744	60,912	60,227	80,306
Alaska	106,602	0.3	36,142	6,301	57,745	6,414
Arizona	287,045	0.8	105,276	62,091	109,196	10,482
Arkansas	121,272	0.3	37,040	2,568	47,047	34,017
California	6,470,806	17.4	1,160,634	2,201,735	2,462,250	646,687
Colorado	262,664	0.7	43,634	14,040	180,358	24,632
Connecticut	2,355,136	6.3	703,479	1,386,493	270,439	44,724
Delaware	42,614	0.1	11,692	6,066	5,658	18,598
District of Columbia	349,743	0.9	112,011	177,669	40,289	10,774
Florida	976,812	2.6	340,256	94,808	478,646	62,602
Georgia	964,223	2.6	74,108	52,313	753,055	84,747
Hawaii	95,623	0.3	28,835	52,721	9,628	4,539
Idaho	17,051	*	3,485	2,383	1,659	9,624
Illinois	932,115	2.5	488,409	128,120	147,085	167,601
Indiana	1,107,508	3.0	692,177	126,850	207,973	80,608
Iowa	260,980	0.7	141,056	26,912	48,087	49,025
Kansas	292,239	0.8	116,466	14,474	125,302	36,051
Kentucky	60,366	0.2	25,076	2,387	4,692	28,311
Louisiana	400,659	1.2	146,516	134,825	9,521	169,797
Maine	75,333	0.2	17,061	41,600	3,917	12,715
Maryland	709,857	1.9	175,747	360,394	129,822	37,894
Massachusetts	1,618,960	4.3	478,274	482,594	554,012	169,080
Michigan	796,211	2.1	524,901	86,397	94,603	90,310
Minnesota	620,123	1.7	204,716	171,083	210,778	38,551
Mississippi	369,201	1.0	14,125	290,615	12,931	51,590
Missouri	1,356,838	3.6	462,552	741,069	98,800	54,003
Montana	20,467	0.1	2,493	873	12,370	4,731
Nebraska	120,452	0.3	62,491	553	15,622	41,786
Nevada	17,897	*	7,043	2,462	8,762	1,630
New Hampshire	155,995	0.4	6,803	114,761	19,527	14,884
New Jersey	1,103,458	3.0	370,655	332,400	201,798	203,605
New Mexico	87,163	0.2	43,721	4,349	29,546	4,547
New York	3,483,885	9.4	783,913	1,322,932	611,531	265,509
North Carolina	487,259	1.3	247,639	94,393	22,664	122,663
North Dakota	68,072	0.2	6,558	50	42,339	19,125
Ohio	1,640,506	4.4	445,142	360,461	727,160	107,743
Oklahoma	164,806	0.4	31,610	6,544	75,674	51,078
Oregon	119,749	0.3	12,874	28,994	11,840	66,041
Pennsylvania	1,727,333	4.6	633,545	592,215	262,478	239,085
Rhode Island	126,362	0.3	27,149	67,137	1,238	30,833
South Carolina	133,041	0.4	13,857	31,878	23,256	64,050
South Dakota	33,585	0.1	953	7,664	23,259	1,709
Tennessee	541,631	1.5	318,316	45,766	78,604	98,955
Texas	4,087,132	11.0	1,047,603	788,555	1,762,762	488,207
Utah	131,195	0.4	34,731	8,027	63,263	27,124
Vermont	104,957	0.3	39,531	3,154	10,089	1,533
Virginia	692,671	1.9	264,740	327,339	35,315	64,777
Washington	629,532	1.7	40,316	111,240	312,163	65,313
West Virginia	131,522	0.4	36,750	10,153	7,525	17,094
Wisconsin	406,409	1.1	258,836	53,637	41,978	51,908
Wyoming	14,351	*	730	42	6,737	7,242

For Footnotes, see Page 35.

^aLess than 0.05%.

Department of Defense

Prime Contract Awards by State

Net Value of Military Procurement Actions by Fiscal Year^a

FISCAL YEARS 1965, 1966 AND 1967

(Amounts in Thousands)

STATE	Fiscal Year 1965		Fiscal Year 1966		Fiscal Year 1967	
	Amount	Percent	Amount	Percent	Amount	Percent
TOTAL, U.S. ^b	\$25,631,132		\$35,713,061		\$41,817,093	
NOT DISTRIBUTED BY STATE ^c	3,363,062		3,999,758		4,435,384	
STATE TOTALS ^d	23,268,080	100.0	31,713,303	100.0	37,381,709	100.0
Alabama	165,176	0.7	281,596	0.9	297,065	0.8
Alaska	74,175	0.3	71,666	0.2	85,448	0.2
Arizona	176,857	0.8	243,228	0.8	249,559	0.7
Arkansas	39,234	0.2	95,701	0.3	127,180	0.3
California	5,153,639	22.1	5,819,078	18.3	6,688,812	17.9
Colorado	249,151	1.1	255,893	0.8	210,409	0.6
Connecticut	1,180,111	5.1	2,051,560	6.5	1,935,895	5.2
Delaware	38,239	0.2	37,445	0.1	51,672	0.1
District of Columbia	247,576	1.0	323,111	1.0	357,666	1.0
Florida	633,832	2.7	766,955	2.4	799,005	2.1
Georgia	662,417	2.8	799,362	2.5	1,148,555	3.1
Hawaii	72,213	0.3	64,170	0.2	65,445	0.2
Idaho	11,724	0.1	20,004	*	14,772	*
Illinois	421,899	1.8	919,779	2.9	1,033,776	2.8
Indiana	604,925	2.6	1,068,259	3.4	898,247	2.4
Iowa	133,951	0.6	247,619	0.8	279,323	0.8
Kansas	229,051	1.0	312,620	1.0	398,918	1.1
Kentucky	42,740	0.2	70,057	0.2	124,294	0.3
Louisiana	255,834	1.1	302,906	1.0	656,031	1.8
Maine	68,771	0.3	51,340	0.2	56,558	0.2
Maryland	584,333	2.5	842,527	2.7	867,990	2.3
Massachusetts	1,178,729	5.1	1,395,952	4.2	1,422,272	3.8
Michigan	532,897	2.3	918,426	2.9	1,033,706	2.8
Minnesota	259,600	1.1	497,994	1.6	650,584	1.7
Mississippi	152,183	0.7	162,305	0.5	114,800	0.3
Missouri	1,060,781	4.6	1,112,605	3.5	2,277,597	6.1
Montana	69,375	0.3	13,779	*	78,452	0.2
Nebraska	42,708	0.2	80,478	0.3	103,522	0.3
Nevada	19,142	0.1	32,023	0.1	29,315	*
New Hampshire	52,400	0.2	109,591	0.3	162,551	0.4
New Jersey	820,809	3.5	1,090,122	3.4	1,234,768	3.3
New Mexico	84,137	0.4	86,230	0.3	80,472	0.2
New York	2,229,473	9.6	2,819,153	8.9	3,261,750	8.7
North Carolina	288,403	1.2	449,331	1.4	447,608	1.2
North Dakota	43,097	0.2	83,113	0.3	16,729	*
Ohio	863,113	3.7	1,588,965	5.0	1,602,593	4.3
Oklahoma	110,803	0.5	153,492	0.5	157,350	0.4
Oregon	39,624	0.2	89,583	0.3	99,319	0.3
Pennsylvania	938,811	4.2	1,665,037	5.3	1,649,091	4.4
Rhode Island	86,823	0.4	131,722	0.4	198,030	0.5
South Carolina	31,580	0.1	176,424	0.6	180,777	0.5
South Dakota	21,062	0.1	23,315	0.1	9,486	*
Tennessee	197,233	0.8	502,163	1.6	533,225	1.5
Texas	1,445,769	6.2	2,291,454	7.2	3,546,978	9.5
Utah	191,173	0.8	169,631	0.5	178,850	0.5
Vermont	82,202	0.1	81,066	0.3	100,157	0.3
Virginia	469,097	2.0	425,437	1.3	655,376	1.8
Washington	545,607	2.3	444,363	1.4	606,114	1.6
West Virginia	30,312	0.1	149,300	0.5	142,142	0.4
Wisconsin	203,003	0.9	384,634	1.1	333,602	1.0
Wyoming	7,867	*	11,112	*	32,863	0.1

For Footnotes, see page 35.

*Less than 0.05 percent.

Department of Defense

Prime Contract Awards by State

Net Value of Civil Functions Procurement Actions ^a

Fiscal Years 1965, 1966, 1967 and 1968

(Amounts in Thousands)

STATE	Fiscal Year 1965 Jul 64-Jun 65	Fiscal Year 1966 Jul 65-Jun 66	Fiscal Year 1967 Jul 66-Jun 67	Fiscal Year 1968 Jul 67-Jun 68
TOTAL, U.S. ^b	\$847,926	\$878,301	\$819,218	\$845,295
NOT DISTRIBUTED BY STATE ^c	41,020	43,532	40,875	44,810
STATE TOTALS ^d	806,906	834,769	778,343	800,485
Alabama	11,958	16,299	18,441	21,921
Alaska	39,516	15,808	2,818	7,250
Arizona	4,301	2,816	2,742	6,381
Arkansas	76,315	89,427	81,658	67,862
California	69,239	67,844	62,991	60,465
Colorado	3,702	922	1,539	3,471
Connecticut	5,476	5,197	7,212	6,761
Delaware	8,639	8,973	12,658	6,024
District of Columbia	887	866	1,071	299
Florida	27,659	26,273	35,334	30,439
Georgia	6,862	7,345	9,390	15,333
Hawaii	1,608	1,439	244	711
Idaho	3,060	5,822	19,556	20,290
Illinois	24,194	22,192	18,046	26,819
Indiana	22,597	25,080	18,062	21,627
Iowa	14,365	12,160	14,578	12,705
Kansas	18,248	12,884	11,611	7,153
Kentucky	19,303	20,219	21,701	19,438
Louisiana	32,156	54,921	40,600	41,074
Maine	2,238	1,628	1,326	1,087
Maryland	21,457	10,212	1,716	4,055
Massachusetts	11,993	5,065	2,703	4,879
Michigan	12,035	13,027	10,915	8,050
Minnesota	1,686	4,128	3,902	4,398
Mississippi	12,018	16,594	18,300	10,686
Missouri	22,756	29,799	30,941	20,417
Montana	1,100	3,774	21,840	52,665
Nebraska	8,148	8,613	6,112	6,860
Nevada	0	0	17	83
New Hampshire	2,431	1,693	107	156
New Jersey	6,803	3,303	2,163	4,888
New Mexico	1,117	3,748	5,955	9,167
New York	13,535	12,400	8,351	14,723
North Carolina	3,797	4,004	3,534	3,929
North Dakota	1,739	3,311	2,151	1,462
Ohio	17,939	15,884	12,442	18,639
Oklahoma	13,952	31,514	48,773	51,698
Oregon	74,243	86,906	44,354	29,995
Oregon	41,620	37,776	37,760	30,445
Pennsylvania	4,951	4,491	574	4,234
Rhode Island	3,608	2,472	2,571	4,151
South Carolina	10,915	6,351	2,249	1,662
South Dakota	14,626	18,773	14,039	12,141
Tennessee	39,420	32,310	28,317	32,146
Texas	41	585	0	25
Utah	33	58	90	101
Vermont	9,364	6,360	8,764	8,992
Virginia	36,323	55,957	68,974	54,128
Washington	33,587	23,182	24,089	18,937
West Virginia	3,426	4,094	5,122	4,776
Wisconsin	20	290	0	34
Wyoming				

For Footnotes, see page 35.

DOD Prime Contract Awards by State

Footnotes

^a See Notes on Coverage below.

^b Includes all contracts awarded for work performance in the United States. The United States includes the 50 states, the District of Columbia, U. S. possessions, the Canal Zone, the Commonwealth of Puerto Rico, and other areas subject to the complete sovereignty of the United States, but does not include occupied Japanese Islands and Trust Territories.

^c Includes contracts of less than \$10,000, all contracts awarded for work performance in the Commonwealth of Puerto Rico, U.S. possessions, and other areas subject to the complete sovereignty of the United States, contracts which are in a classified location, and any intragovernmental contracts entered into overseas.

^d Net value of contracts of \$10,000 or more for work in each state and the District of Columbia.

^e Civil functions of the Army Corps of Engineers for flood control and rivers and harbors work. Civil functions data are shown separately, and are not included in military functions tabulations.

Notes on Coverage

It is emphasized that data on prime contracts by state do not provide any direct indication as to the state in which the actual production work is done. For the majority of contracts with manufacturers, the data reflect the location of the plant where the product will be finally processed and assembled. If processing or assembly is to be performed in more than one plant of a prime contractor, the location shown is the plant where the largest dollar amount of work will take place. Construction contracts are shown for the state where the construction is to be performed. For purchases from wholesale or other distribution firms, the location is the address of the contractor's place of business. For service contracts, the location is generally the place where the service is performed, but for transportation and communications services the home office address is frequently used.

More important is the fact that the reports refer to prime contracts only, and cannot in any way reflect the distribution of the very substantial amount of material and component fabrication and other subcontract work that may be done outside the state where final assembly or delivery takes place.

The report includes definitive contracts, and funded portions of letter contracts and letters of intent, job orders, task orders, and purchase orders on industrial firms, and also includes interdepartmental purchases, made from or through other governmental agencies, such as those made through the General Services Administration. The state data include upward or downward revisions and adjustments of \$10,000 or more, such as cancellations, price changes, supplemental agreements, amendments, etc.

The estimated amounts of indefinite delivery, open-end or call type contracts for petroleum are included in the report. Except for petroleum contracts, the report does not include indefinite delivery, open-end, or call type contracts as such, but does include specific purchase or delivery orders of \$10,000 or more which are placed against these contracts. Also excluded from the report are project orders, i.e., production orders issued to government-owned-and-operated facilities such as Navy shipyards. However, the report includes the contracts placed with industry by the government-operated facility to complete the production order.

Conference Date Changed

The date of the Defense Procurement Conference to be held in Los Angeles, Calif., has been changed to Dec. 6.

The conference was originally set for Dec. 1.

Information contact and location of the conference will remain as previously announced in the September issue of the *Defense Industry Bulletin* on page 29.

Clearinghouse Begins New Title Review Service

The Clearinghouse for Federal Scientific and Technical Information of the U.S. Department of Commerce's National Bureau of Standards has inaugurated a new announcement service designed for quick review by the user.

Called CAST, Clearinghouse Announcements in Science and Technology, the new system will provide all report titles made available to the clearinghouse under 46 separate categories of technology.

CASTs will be published twice a month, on the 10th and 25th, and will average four pages per category. The new service began with the July 10 issue.

Subscriptions to CAST are now available from the Clearinghouse at \$5 a year (\$6.25 foreign) for the first category, and \$5 a year (\$6.25 foreign) for each additional two categories.

For a sample copy and subscription order blank for CAST, write to:

Clearinghouse (410.61)
U.S. Department of Commerce
Springfield, Va. 22151

International Ocean Exploration Urged

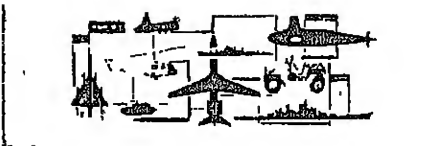
The National Council on Marine Resources and Engineering Development has released a report that urges all nations to join together in efforts to plan, develop and implement programs for exploring the world's oceans.

The report, titled "International Decade of Ocean Exploration," was made by the council in response to President Johnson's proposal for an International Decade of Ocean Exploration for the 1970s.

Purpose of the 12-page report is to foster further development of the decade concept by scientists, engineers, and representatives from industry and governments.

To plan the U.S. contribution to the Decade, a joint non-government/government planning staff will be established by the National Council on Marine Resources and Engineering Development.

The report is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at 15¢ a copy.



DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of September 1968.

DEFENSE SUPPLY AGENCY

- 4—Valley Metallurgical Processing Co., Essex, Conn. \$1,881,171. 1,894,875 lbs. of magnesium powder. Defense General Supply Center, Richmond, Va. DSA 400-09-C-1810.
- 10—L.B.M. Corp., Washington, D.C. \$1,595,000. Purchase of previously leased automatic data processing equipment. Defense Supply Agency, Alexandria, Va. DSAH-00-69-F-0004.
- 13—Safety First Shoe Co., Nashville, Tenn. \$1,439,816. 165,488 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0434.
- Randolph Mfg. Co., Randolph, Mass. \$1,170,400. 140,000 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0433.
- Bata Shoe Co., Belcamp, Md. \$3,913,631. 434,337 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0435.
- Alabama Refining Co., Theodore, Ala. \$1,034,184. 10,020,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2178 MOD P003.
- Atlantic Richfield Co., Philadelphia, Pa. \$2,213,400. 21,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0120 MOD P001.
- Cities Service Oil Co., New York, N.Y. \$2,037,504. 21,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0429 MOD P006.
- Mobil Oil Corp., New York, N.Y. \$1,616,380. 14,600,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2225 MOD P007.
- Phillips Petroleum Co., Bartlesville, Okla. \$1,021,925. 10,250,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2232 MOD P003.
- Southwestern Oil & Refining Co., Corpus Christi, Tex. \$2,502,360. 25,200,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2240 MOD P005.
- 16—Gulf Oil, New York, N.Y. \$3,786,132. 37,800,000 gallons of JP-5 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-2166.
- 10—United Fruit & Food Corp., Boston, Mass. \$2,229,787. 175,268 pounds of dehydrated shrimp. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-E016.
- 23—Blue Bell, Inc., Greensboro, N.C. \$1,657,100. 1,764,242 pairs of men's cotton sateen trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0432.
- Marble Dale, Atlantic City, N.J. \$1,993,734. 110,100 men's wool serge coats for the Marine Corps. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0473.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting Agency—Contract Number.

- Gulf Oil Corp., Houston, Tex. \$1,240,842. 251,630 barrels of diesel fuel and 38,600 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0377.
- Shell Oil Co., New York, N.Y. \$1,045,859. 541,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0390.
- 24—Pioneer Bag Co., Kansas City, Mo. \$3,273,435. 5,056,000 polypropylene sandbags and 6,875,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1141-P001.
- Cavaller Bag Co., Lumberton, N.C. \$12,682,517. 28,044,000 polypropylene sandbags and 24,125,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-1144-P001.
- 26—Mobil Oil Corp., New York, N.Y. \$2,023,129. 5,000 gallons of gasoline, 14,250 barrels of diesel fuel and 1,050,300 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0387.
- Union Oil Co., Los Angeles, Calif. \$1,558,271. 1,030,000 barrels of number six fuel oil and 1,750 barrels of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0397.
- 30—West Point Pepperell, Inc., New York, N.Y. \$3,632,695. 1,965,000 linear yards of nylon ballistic cloth. Defense Personnel Support Center, Philadelphia, Pa. AG31-69-C-0059.



DEPARTMENT OF THE ARMY

- 3—Mills Mfg. Corp., Ashville, N.C. \$1,917,648. Cargo parachutes. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0120.
- Pace Corp., Memphis, Tenn. \$1,869,210. M1A2 torpedo demolition kits. Army Procurement Agency, Cincinnati, Ohio. DA AG31-69-C-0059.
- MacGregor Triangle Co., Boise, Idaho. \$3,229,216. Work on roads near the Libby, Mont., dam project. Engineer Dist., Seattle, Wash. DA CW67-67-69-C-0009.
- Bell Aerospace Corp., Fort Worth, Tex. \$9,784,400. UH-1N helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AF01-69-C-0085.
- Standard Container Co., Montclair, N.J. \$1,007,784. M2A1 ammunition boxes. Homerville, Ga. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0558.
- Hughes Tool Co., Culver City, Calif. \$7,208,000. OH-6A light observation helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1780.
- 4—Colt's Inc., Hartford, Conn. \$2,395,503. Seventeen line items of repair parts in support of the M16 weapons family. Army Weapons Command, Rock Island, Ill. DA AF03-69-C-0008.
- General Motors, Cleveland, Ohio. \$20,738,456. M551 armored reconnaissance airborne assault vehicles. Army Weapons Command, Rock Island, Ill. DA 11-199-AMC-00610 (W).
- 5—Northrop-Carlson, Inc., Ashville, N.C. \$1,804,595. 40mm cartridges. Swannanoa, N.C. Edgewood Arsenal, Edgewood, Md. DA AA16-68-C-0862.
- United Aircraft, Stratford, Conn. \$3,600,000. CH-54A helicopters complete with engine air particle separators and crew armor. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0827.
- 6—Philco Ford Corp., Newport Beach, Calif.

- \$3,634,000. A classified amount of Chaparral fire units, and weapons system test equipment. Anaheim, Calif. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0369.
- Eureka Williams Co., Bloomington, Ill. \$6,833,664. Metal parts for nose fuzes for aerial bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0068.
- United Aircraft, Stratford, Conn. \$3,500,000 (contract modification). Product improvement program to increase the capability of CH-54A helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0827.
- Bell Helicopter, Fort Worth, Tex. \$3,008,377 (contract modification). UH-1H helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0028.
- Bell Helicopter, Fort Worth, Tex. \$1,693,944. Rotary rudder booms. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- Bell Helicopter, Fort Worth, Tex. \$2,823,500. Environmental control systems for AH-1G helicopters. Aviation Materiel Command, St. Louis, Mo.
- American University, Washington, D.C. \$1,335,000 (contract modification). Continuation of research and scientific studies. Defense Supply Service, Washington, D.C. DA HC15-67-C-0015.
- 9—Olin Mathieson Chemical Corp., East Alton, Ill. \$10,354,000. 81mm projectile loading assembly. Marlon, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0088.
- Firestone Tire & Rubber Co., Akron, Ohio. \$7,269,630 (contract modification). Loading, assembling and packing primers and 155mm artillery items. Ravenscroft, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00065 (A).
- Raytheon Co., Lexington, Mass. \$4,493,000. DA AA09-69-C-0073. \$3,812,738. Metal parts for 750-lb. bomb nose fuzes. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0069.
- Batesville Mfg. Co., Batesville, Ark. \$3,000,750-lb. bomb tail fuzes. Bristol, Tenn. 211,600. Metal parts for 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0069.
- 10—Norris Industries, Everett, Mass. \$9,150,723. 60mm rocket launchers. Brockton, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0085.
- Ford Motors, Wixom, Mich. \$5,695,192. Trucks. Mahwah, N.J. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0887.
- Morrison-Knudsen Co., New York, N.Y. \$3,684,241. Eisenhower and Snell Locks on the St. Lawrence Seaway. Near Massena, N.Y. Engineer Dist., Buffalo, N.Y. DA CW40-69-C-0008.
- Uniroyal, Inc., Detroit, Mich. \$2,728,500 (contract modification). Pneumatic tires for five and ten-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0006.
- Airport Machining Corp., Martin, Tenn. \$1,702,255. 60mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0064.
- Bell Aerospace Corp., Fort Worth, Tex. \$1,002,474. Tail boom assemblies for the AH-1G helicopter. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- 11—S. S. Mullen, Inc., Seattle, Wash. \$14,641,996. Construction of family housing at Elmendorf and Eielson Air Force Bases, Alaska. Engineer Dist., Anchorage, Alaska. DA GA85-69-C-0014.
- General Electric, Springfield, Mass. \$2,635,253 (contract modification). Machine guns for M60 vehicles. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0088.

- Johnson Construction Co., Minneapolis, Minn. \$1,310,770. Construction in connection with the Salamonca Flood Protection Project, Cattaraugus County, N.Y. Engineer Dist., Pittsburgh, Pa. DA CW59-69-C-0015.
- Weatherhead Co., Cleveland, Ohio. \$2,554,500. Metal parts for 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0081.
- Oemet, Inc., Nashville, Tenn. \$2,409,000. Metal parts for 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0082.
- Eureka-Williams Co., Bloomington, Ind. \$1,015,401. Metal parts for MK 80, MOD 0, arming devices. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0067.
- 12—Kennedy-Van Saun Corp., Danville, Pa. \$6,980,800. 4.2-inch projectile metal parts. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0079.
- Wagner Electric Corp., St. Louis, Mo. \$4,559,500. 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0078.
- U.S. Forgercraft Corp., Fort Smith, Ark. \$3,564,000. 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0080.
- Supreme Products Corp., Chicago, Ill. \$1,436,800. Metal parts for 750-lb. bomb tail fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0074.
- Stewart Warner Corp., Indianapolis, Ind. \$1,014,160. Metal parts for 750-lb. bomb nose fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0071.
- Olin Mathieson Chemical Corp., New Haven, Conn. \$1,722,844. 7.62mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0090.
- Remington Arms Co., Bridgeport, Conn. \$1,486,000. 7.62mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0088.
- Olin Mathieson Chemical Corp., East Alton, Ill. \$1,334,765. 7.62mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0089.
- Seattle Stevedore Co., Seattle, Wash. \$2,716,390. Stevedoring services at the Port of Tacoma, Wash., from Oct. 1, 1968 through Sept. 30, 1970. Western Area Military Traffic Management & Terminal Service, Oakland, Calif. DA HC23-69-D-0009.
- Boeing Co., Huntsville, Ala. \$1,104,288. Industrial prototypes and production engineering services on improved Hawk wings. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0408.
- Delaval Turbine, Inc., Trenton, N.J. \$1,030,350. Turbine generator and accessories for a 38 megawatt power plant. Fort Clayton, Panama, Canal Zone. Engineer Dist., Jacksonville, Fla. DA CA17-69-C-0006.
- 13—R. G. LeTourneau, Longview, Tex. \$5,980,800. Metal parts for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0044.
- Action Mfg. Co., Philadelphia, Pa. \$2,464,300. Metal parts for 750-lb. bomb tail fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0075.
- Delaware Valley Armaments, Mount Laurel, N.J. \$10,244,000. Metal parts for M567 fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0098.
- Lear Siegler, Anaheim, Calif. \$10,304,000. Metal parts for M567 fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0103.
- General Time Corp., Stamford, Conn. \$9,805,000. Metal parts for M567 fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0094.
- McGraw-Edison, Bristol, Conn. \$9,485,000. Metal parts for M567 fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0090.
- Etawah Mfg. Co., Gadsden, Ala. \$3,814,800. Metal parts for M567 fuze boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0092.
- Fegles Construction Co. and O&I/Girdler, Inc., Minneapolis, Minn. \$20,000,000. Construction of a munitions plant at Newport Army Ammunition Plant, Indiana Engineer Dist., Chicago, Ill. DA CA23-69-C-0020.
- Bell Aerospace Corp., Fort Worth, Tex. \$16,278,335. OH-58A light observation helicopters and related data. Hurst, Tex. and Wichita, Kan. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1609.
- Western Electric, New York, N.Y. \$9,540,000. Radar data collection and reduction at Kwajalein Missile Range Sentinel Systems Command, Huntsville, Ala. DA HC60-69-C-0001.
- West Coast Machinery, Inc., Stockton, Calif. \$6,332,837. Portable water tank trailers. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0340.
- M. M. Sundt Construction Co., Tucson, Ariz. \$1,733,002. Construction of a parallel runway at Williams AFB, Ariz. Engineer Dist., Los Angeles, Calif. DA CA49-69-C-0087.
- 16—T. L. James & Son, Inc., Ruston, La. \$2,222,860. Channel dredging for lock and dam number 13 at the Arkansas River navigation project. Muldrow, Okla. and Fort Smith, Ark. Engineer Dist., Tulsa, Okla. DA CW66-69-C-0023.
- Kentrone Hawaii, Ltd., Honolulu, Hawaii. \$9,777,000. Continued operation and maintenance of the technical facilities at Kwajalein Atoll Sentinel System Command, Huntsville, Ala. DA HC60-69-C-0003.
- American Dredging Co., Philadelphia, Pa. \$2,065,000. Channel dredging for lock and dam number 14 of the Arkansas navigation project. Sequoyah and Le Flore Counties, Okla. Engineer Dist., Tulsa, Okla. DA CW66-69-C-0027.
- Patrechld Space & Defense Systems, Syoset, N.Y. \$1,572,516 (contract modification). M804 cased unit assemblies with XM78 electric detonators for Shillelagh missile systems. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0173.
- Weatherhead Co., Cleveland, Ohio. \$2,282,400. Parts for obtaining assemblies for 4.2-inch mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0101.
- Alcan Aluminum Corp., Riverside, Calif. \$2,327,336. Metal parts for rocket motors. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0107.
- General Motors, Cleveland, Ohio. \$3,442,860. 155mm self-propelled howitzers. Army Weapons Command, Rock Island, Ill. DA 11-199-AMC-00610 (W).
- Eby Construction Co., Wichita, Kan. \$1,631,022. Dredging work at the lock and dam number 13, Arkansas River navigation project. Le Flore County, Okla. and Crawford County, Ark. Engineer Dist., Tulsa, Okla. DA CW66-69-C-0024.
- 17—General Motors, Cleveland, Ohio. \$1,700,282 (contract modification). M109 (155mm) self-propelled howitzers. Army Weapons Command, Rock Island, Ill. DA 11-199-AMC-0010 (W).
- Continental Motors, Muskegon, Mich. \$2,817,230. Multi-fuel engine assemblies for five-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0252.
- Chrysler Corp., Warren, Mich. \$3,177,278. Two hundred semi-trailers. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0187.
- 18—Firestone Tire & Rubber Co., Akron, Ohio. \$3,325,432. T130 tract shoe assemblies for M118 personnel carriers. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0017.
- Hol-Gar Mfg. Corp., Primos, Pa. \$1,086,645. Generator sets for night vision Xenon searchlights. Research and Development Equipment Command, Fort Belvoir, Va. DA AK02-67-C-0399.
- Jackes-Evans Co., St. Louis, Mo. \$2,730,000 (contract modification). M13 links for 7.62mm machine guns. Frankford Arsenal, Philadelphia, Pa. DA AG11-68-C-1152.
- General Time Corp., LaSalle, Ill. \$1,697,115. Metal parts for fuzes for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0106.
- Gibbs Mfg. & Research Corp., Janesville, Wis. \$1,992,600. Metal parts for fuzes for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0104.
- Sanford Construction Co., Cleveland, Ohio. \$2,058,210. Construction of five motel-type officers quarters and one mechanical building at Wright-Patterson AFB, Ohio. Engineer Dist., Louisville, Ky. DA CA27-69-C-0008.
- 19—Norris Industries, Vernon, Calif. \$6,688,000. 105mm cartridge cases. Pico Riviera, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0056.
- Airport Machining Corp., Martin, Tenn. \$3,469,050. Metal parts for 2.75-inch rockets. Union, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0087.
- Medico Industries, Wilkes Barre, Pa. \$3,090,600. Metal parts for 2.75-inch rockets. Ammunition Procurement & Supply Agency, Joliet, Ill.
- General Dynamics, Pomona, Calif. \$11,666,844. A classified amount of Red Eye missiles. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0231.
- 20—Greenhut Construction Co., Pensacola, Fla. \$3,253,900. Conversion of two buildings to BQs. Fort Benning Ga. Engineer Dist., Savannah, Ga. DA CA21-69-C-0016.
- General Motors, Indianapolis, Ind. \$1,089,780. Turbine assemblies for T63A5A engines for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA 2-204-AMC-03262.
- Hughes Tool Co., Culver City, Calif. \$7,800,000. Components and spare parts for OH-6A helicopters. Aviation Materiel Command, St. Louis, Mo. DA 2-204-03697.
- A.O. Smith Corp., Chicago, Ill. \$81,783,540. Metal parts for 750-lb. bombs. Belmeade, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0102.
- UMC Industries, Phoenix, Ariz. \$2,253,000. Loading and assembling 81mm illuminating projectiles. Goodyear, Ariz. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0096.
- 23—Olin Mathieson Chemical Corp., New York, N.Y. \$72,703,775. Operation and maintenance of a GOCO facility for production of propellants, bars and related ammunition components. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-178-AMC-00097 (A).
- Federal Cartridge Corp., Minneapolis, Minn. \$14,162,763 (contract modification). Operation of a GOCO facility for production of small arms ammunition and support services. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 36-038-AMC-01000 (A).
- Weatherhead Co., Cleveland, Ohio. \$2,610,138. 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0116.
- Ford Motors, Highland Park, Mich. \$34,377,165. Quarter-ton trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0001.
- Chrysler Corp., Warren, Mich. \$19,484,712. M60A1E2 combat tanks. Army Weapons Command, Rock Island, Ill. DA AF-09-69-C-0018.
- Bell Aerospace Co., Fort Worth, Tex. \$1,068,010. UH-1 aircraft gen box assemblies. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.
- 24—U.S. Time Corp., Watertown, Conn. \$10,500,000. Artillery shell fuzes. Waterbury, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0129.
- General Motors, Detroit, Mich. \$5,812,199 (contract modification). Diesel engines for M113 vehicles. Tank Automotive Command, Warren, Mich. DA AE07-68-C-0410.
- Amotek, Inc., Sheboygan, Wis. \$2,462,345. Support assemblies for ammunition fiber containers. Plymouth, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0120.
- General Motors, Cleveland, Ohio. \$2,036,678 (contract modification). Durability testing of AVCR-1100-3 engines for SM70 main battle tanks. Detroit, Mich. Tank Automotive Command, Warren, Mich. DA 09-113-AMC-03843.
- Honeywell, Inc., Hopkins, Minn. \$1,379,375 (definitization of a previously awarded letter contract). XM224 grenade fuzes. New Brighton, Minn. Army Procurement Agency, Chicago, Ill. DA AA09-68-C-0490.
- Dresser Industries, Columbus, Ohio. \$1,000,000. Classified electronic equipment.

- Electronics Command, Fort Monmouth, N.J.
- 25—Hercules, Inc., Wilmington, Del. \$26,560,696 (contract modification). Production of MK 43 grain for 2.75-inch rockets, mixed acids; and support services. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00042(A).
- Remington Arms Co., Bridgeport, Conn. \$22,715,053 (contract modification). Production of small arms ammunition components and support services. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 49-010-AMC-8(A).
- Olin Mathieson Chemical Corp., New York, N.Y. \$22,990,950 (contract modification). Production of propellants and support services. Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0014.
- Brads Machine Products, Gadsden, Ala. \$15,440,000. Metal parts for M567 fuze components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0147.
- Heckethorn Mfg. Co., Dyersburg, Tenn. \$1,808,000. Metal parts for hand grenades. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0127.
- General Motors, Indianapolis, Ind. \$3,470,010. OH-6A and OH-58A helicopter engines. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0140.
- AVCO Corp., Stratford, Conn. \$3,179,272. T-55 engine components; \$1,296,153. T-53 engine components. Aviation Materiel Command, St. Louis, Mo. AF 41-608-67-A-3234.
- Lear-Siegler, Inc., Maple Heights, Ohio \$1,102,030 (contract modification). CH-47 aircraft generators. Aviation Materiel Command, St. Louis, Mo. DA AJ01-67-D-1052.
- Brunswick Corp., Sugar Grove, Va. \$1,097,492 (contract modification). 35mm launchers. Edgewood Arsenal, Md. DA 18-035-AMC-0062.
- 26—National Presto Industries, Eau Claire, Wis. \$13,893,750. Metal parts for M10b projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0109.
- TRW, Inc., Washington, D.C. \$4,978,006. Integrated technical data system. Harry Diamond Laboratories, Washington, D.C. DA 48-186-AMC-0034(X).
- Goodyear Tire & Rubber Co., Akron, Ohio \$4,894,860 (contract modification). Shoe assemblies for M48 and M60 tanks. St. Mary's, Ohio. Tank Automotive Command, Warren, Mich. DA AE07-68-C-0087.
- Parsons Mfg. & Stamping Co., Cordova, Tenn. \$2,912,000. 4.2-inch mortar assembly components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0137.
- AVCO Corp., Stratford, Conn. \$2,096,500. UH-1 aircraft engine modification kits. Aviation Materiel Command, St. Louis, Mo. AF 41-608-67-A-3234.
- Povru Construction Co., Waltham, Mass. \$1,461,000. Construction of a laboratory support service building at the Army Natick Laboratory, Natick, Mass. New England Engineer Div., Waltham, Mass. DA CA38-69-C-0009.
- 27—Western Electric, New York, N.Y. \$273,171,000. Continued research and development for the Sentinel Ballistic Missile Defense System for period of Oct. 1 1968 through July 31, 1969, and for perimeter acquisition radar hardware; \$202,375,819. Sentinel production engineering and hardware. Sentinel System Command, Huntsville, Ala. DA 30-069-AMC-00383(Y) and DA HC80-68-C-0017.
- Stanford Research Institute, Menlo Park, Calif. \$2,069,279. Studies for the Anti-Missile-Missile System. Sentinel System Command, Huntsville, Ala. DA HC80-68-C-0004.
- Kisco Co., St. Louis, Mo. \$13,400,000. 105mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0043.
- Eisen Bros., Lodi, N.J. \$6,040,100. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0132.
- Amtron Corp., Waukesha, Wis. \$3,960,560. Metal parts for 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0144.
- Lasko Metal Products, Inc., West Chester, Pa. \$3,777,955. Metal parts for bomb dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0156.
- Harvey Aluminum, Inc., Torrance, Calif. \$3,113,415. Metal parts for 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0143.
- Eastern Tool & Mfg. Co., Belleville, N.J. \$1,606,440. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0133.
- AVCO Corp., Richmond, Ind. \$1,324,965. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0131.
- General Plastics Corp., Los Angeles, Calif. \$1,050,403 M564 and M565 fuze supports. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0160.
- Kaiser Jeep Corp., Toledo, Ohio. \$42,413,060 (contract modification). Two-and-a-half-ton trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0007.
- Onegla & Gervasi Construction Co., Torrington, Conn. \$14,765,580. Construction of channels and canals, levees and flood walls pumping plants and appurtenant works for the Ansonia-Deiby Local Protection Project, New Haven County, Conn. New England Div., Waltham, Mass. DA CW83-69-C-0027.
- Ford Motors, Dearborn, Mich. \$10,500,000. Five-ton trucks, Mt. Clemens, Mich. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-68-C-0003.
- United Ammunition Container, Inc., Philadelphia, Pa. \$4,228,427. Artillery ammunition containers. Atlanta, Tex. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0219.
- Riccardi Co., Alpha, N.J. \$4,004,625. Artillery ammunition containers. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0218.
- General Electric, Burlington, Vt. \$1,620,000. 20mm machine guns. Army Weapons Command, Rock Island, Ill. DA AF03-69-C-0010.
- National Cash Register Co., Dayton, Ohio. \$1,180,000. Services and materials to mount ADP systems in Government-furnished vans. Electronics Command, Philadelphia, Pa. DA AB05-69-C-0202.
- Raytheon Co., Andover, Mass. \$1,112,991 (contract modification). Engineering services for the improved HAWK missile system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0009.
- SKF Industries, Philadelphia, Pa. \$1,000,112. Roller bearings for T-53 engines used on the UH-1 aircraft. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0203.
- 30—Philco-Ford Corp., Newport Beach, Calif. \$13,839,799. Guidance and control equipment for Shilleagh missiles. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0480.
- Western Electric, New York, N.Y. \$20,795,000. Continued research and development on the Nike-X advanced development program; \$2,808,470. Development of training courses and specifications for training devices for the Sentinel Weapon System. Sentinel System Command, Huntsville, Ala. DA HC80-69-C-0008 and DA HC80-69-C-0010.
- Western Electric, Greensboro, N.C. \$1,174,014. Sentinel training aid devices. Sentinel System Command, Huntsville, Ala. DA HC60-68-C-0017.
- Western Electric, Burlington, N.C. \$5,197,500. Nike Hercules improved kits. Sentinel System Command, Huntsville, Ala. DA AH01-67-A-0028.
- Hercules Engines, Inc., Canton, Ohio. \$13,247,630 (contract modification). Multi-fuel engine assemblies for 2½-ton trucks. Tank Automotive Command, Warren, Mich. DA AE06-68-C-0006.
- Honeywell, Inc., Tampa, Fla. \$4,000,000 (contract modification). Classified electronic equipment. Electronics Command, Fort Monmouth, N.J. DA AB03-69-C-01737(X).
- Amtron, Inc., Midlothian, Ill. \$5,000,000. Switchboards. Electronics Command, Fort Monmouth, N.J. DA AB07-69-C-0028.
- ITT Corp., Nutley, N.J. \$3,566,649 (contract modification). AN/GRC-144 radio sets and antenna alignment indicators. Clifton, N.J. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0027.
- Duffers Associates, Troy, N.Y. \$1,165,772 (increment to an existing contract). Battery chargers. Poestenkill, N.Y. Electronics Command, Philadelphia, Pa. DA AB05-67-C-1676.
- LTV Electrosystems, Inc., Huntington, Ind. \$1,061,626 (increment to an existing contract). Vehicular radio components. Electronics Command, Philadelphia, Pa. DA AB05-67-C-0171.
- Chamberlain Corp., Burlington, N.J. \$8,119,714. Metal parts for 81mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0161.
- Eastern Tool and Mfg. Co., Belleville, N.J. Metal parts for warheads for high explosive rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0167.
- Kennedy Van Saun Corp., Danville, Pa. \$2,554,285 (contract modification). Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0109.
- Ensign Bleckford Co., Simsbury, Conn. \$1,019,172. M56 rocket motor igniters and M20A1 primers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0155.
- Harvey Aluminum Corp., Torrance, Calif. \$1,655,162. Motor closures for M-72 rockets. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0159.
- Carter Carburetor, St. Louis, Mo. \$3,467,325. M52 fuze bodies for 60mm projectiles. Olivette, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0145.
- General Electric, Burlington, Vt. \$10,885,770. 20mm self-propelled guns. Army Procurement Agency, New York, N.Y. DA AG25-69-C-0346.
- Tomeco, Inc., Nashville, Tenn. \$1,367,604. M3 fin assemblies for 105mm projectiles. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0224.
- Norris Industries, Los Angeles, Calif. \$2,597,963 (contract modification). 105mm cartridge cases. Army Procurement Agency, Los Angeles, Calif. DA AG07-69-C-0035.
- Highland Industries, Kansas City, Mo. \$1,134,629 (increment to an existing contract). Tank and pump units for petroleum trucks. Mobility Equipment Command, St. Louis, Mo. DA AK01-67-C-B267.



DEPARTMENT OF THE NAVY

- 3—Dotyens Shipyard, Mt. Pleasant, S.C. \$1,283,822. Overhaul and alteration of the USNS Private Jose F. Valdez. Military Sea Transportation Service.
- Lockheed Aircraft, Sunnyvale, Calif. \$1,237,000. Posidon advanced guidance system. Strategic Systems Project Office. N00030-69-C-0100.
- 4—Collins Radio Co., Richardson, Tex. \$7,199,032. Eight mainline technical data systems. Naval Electronic Systems Command. N00039-69-C-3506.
- Quality Pacific, Ltd., Honolulu, Hawaii. \$1,084,705. Construction of an advanced technical support facility and modernization of a ship repair facility at the Naval Submarine Base, Pearl Harbor, Hawaii. Naval Facilities Engineering Command.
- B. C. Ernst, Inc., Norfolk, Va. \$1,893,884. Installation of utilities at Piers 2, 3, and 4 at the Naval Station, Norfolk, Va. Naval Facilities Engineering Command. N62470-68-C-0632.
- North American Rockwell Corp., Anaheim, Calif. \$1,509,000. Operation and maintenance of ships inertial navigation systems equipment for one year. Naval Ship Systems Command. N00024-69-

- C-5110.
—Horne-Zwick Construction Co., Suisun City, Calif. \$1,182,000. Construction of a BOQ and mess hall at the San Francisco Bay Naval Shipyard, Hunters Point Div., San Francisco, Calif. Naval Facilities Engineering Command. N62474-67-C-0737.
- 5—The following modifications to fixed price contracts have been made by the Naval Air Systems Command for contract definition phase of the VFX weapon system:
—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$1,000,000. N00019-69-C-0053.
—LTV Aerospace Corp., Dallas, Tex. \$1,000,000. N00019-69-C-0052.
—General Dynamics, San Diego, Calif. \$1,000,000. N00019-69-C-0047.
—North American Rockwell Corp., El Segundo, Calif. \$1,000,000. N00019-69-C-0043.
—McDonnell Douglas Corp., St. Louis, Mo. \$1,000,000. N00019-69-C-0051.
—Pasco Steel Corp., Pomona, Calif. \$1,088,898. Procurement of 60 units of pontoons for the Construction Battalion Center, Port Hueneme, Calif. Naval Facilities Engineering Command. N62473-69-C-0004.
—United Aircraft, East Hartford, Conn. \$1,832,400. JT3D-3B engines. Naval Air Systems Command. N00019-68-C-0472.
—Bethlehem Steel, Boston, Mass. \$1,975,503. Topside overhaul work on the older USS Mississinewa (AO-144). Supervisor of Shipbuilding, Conversion and Repair, First Naval Dist., Boston, Mass.
- 6—Westinghouse Electric, Baltimore, Md. \$1,434,800. AN/APG-59 radar sets. Naval Air Systems Command. N00019-68-C-0570.
—Goodyear Aerospace Corp., Akron, Ohio \$1,636,905. Production of Subroc missiles. Naval Ordnance Systems Command. N00017-69-C-1407.
—General Precision Systems, Glendale, Calif. \$1,400,000. Increased production of MK48 torpedo fire control system modification kits. Naval Ordnance Systems Command. N00017-68-C-1218.
—PRD Electronics, Jericho, N.Y. \$1,043,521 (contract modification). To increase the limitation of authorization for VAST systems and associated ancillary items. Naval Air Systems Command. N00019-67-C-0481.
- 9—Dow Chemical Co., Midland, Mich. \$11,140,411. AM-2 airfield landing mats. Enterprise, Ala. and Madison, Ill. Naval Air Engineering Center, Philadelphia, Pa. N00156-69-C-0680.
—Norris Industries, Los Angeles, Calif. \$3,211,200. Eight-inch 55-cal. brass cartridge cases. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0042.
—Raytheon Co., Lowell, Mass. \$1,698,600. Sparrow Three missile modification kits. Oxnard, Calif. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-A-0006.
—Hughes Aircraft, Culver City, Calif. \$1,492,122. Electronic warfare sub-system research. Office of Naval Research.
—Western Electric, New York, N.Y. \$1,095,615. Production of Tartar weapons direction equipment. Burlington, N.C. Naval Ordnance Systems Command. N00017-68-C-2310.
- 10—Boeing Co., Morton, Pa. \$7,058,000 (contract modification). Long lead time requirements for FY69 procurement of CH-40 helicopters. Naval Air Systems Command. N00019-68-C-0391.
—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$5,000,000 (contract modification). Long lead time effort and materials to support modification of aircraft to a multi sensor configuration. Naval Air Systems Command. N00010-68-C-0056.
—Sperry Rand Corp., Syosset, N.Y. \$3,147,870. Computer components, repair parts and technical data. Naval Ship Systems Command. N00024-69-C-5100.
- 11—Fairchild Camera & Instrument Corp., Syosset, N.Y. \$1,267,438. Fuze bases for 5-inch, 38-cal. projectiles. Congine, N.Y. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0034.
—United Aircraft, East Hartford, Conn. \$1,041,810. J-48 engine blades for F-9 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-8-6000A-AF073.
- 12—American Mfg. Co. of Tex., Fort Worth, Tex. \$3,250,000. Five-inch, 54-cal. ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0036.
—Sperry Rand Corp., Great Neck, N.Y. \$6,931,550. Increased production of AN/SPG-5B Terrier radar sets. Naval Ordnance Systems Command. N00019-68-C-0537F.
—Collins Radio Co., Newport Beach, Calif. \$2,483,997. Manufacture of generators and ancillary equipment. Naval Electronic Systems Command. N00039-69-C-2513.
—General Dynamics, Pomona, Calif. \$2,289,067. Research and development on the Standard Arm missile. Naval Air Systems Command. N00019-68-C-0400.
—United Aircraft, East Hartford, Conn. \$1,686,127. J60P3A/P6 engine spare parts. Aviation Supply Office, Philadelphia, Pa. N00383-8-65800A-AA298.
—United Aircraft, East Hartford, Conn. \$1,207,645. Spare parts to support J57 engines on F8, A3, A6 and A4 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-8-69-000A-AF891.
—General Dynamics, Groton, Conn. \$1,000,000. Advance planning and design work for the nuclear powered fleet ballistic missile submarine USS George Washington (SSBN-598). Naval Ship Systems Command. N00024-69-C-0285.
- 13—Sanders Associates, Nashua, N.H. \$2,409,570. H F band sweeping receivers. Naval Electronic Systems Command. N00039-68-C-2508.
—Lockheed Aircraft, Sunnyvale, Calif. \$1,817,143. Advanced engineering studies for Poseidon. Strategic Systems Project Office. N00030-69-C-0108.
—Hughes Aircraft, Fullerton, Calif. \$7,459,236. Radar sets, components and engineering services. Naval Ship Systems Command. N00024-69-C-1006.
—EDO Corp., College Point, N.Y. \$3,095,863. Long-range detection and tracking sonar equipment. Naval Ship Systems Command. N00024-69-C-1029.
—Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$1,095,000. Design and furnish nuclear propulsion components. Naval Ship Systems Command. N00024-68-C-0288.
- 17—Metals Engineering Corp., Greenville, Tenn. \$13,428,454. MK 82, MOD 1, conical bomb fin assemblies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0066.
—North American Rockwell Corp., Columbus, Ohio. \$8,108,908 (contract modification). Incremental funding for Phase II engineering development of the Condor missile system. Naval Air Systems Command. N00019-68-C-0728.
—FMC Corp., Minneapolis, Minn. \$7,673,100. Production of 57/64 gun mounts and related equipment. Naval Ordnance Systems Command. N00017-68-C-1211.
—Campbell Co. and General Contractors, Tyler, Tex. \$7,534,230. Construction of barracks, mess hall, utilities and heating plant. Marine Corps Base, Camp Lejeune, N.C. Naval Facilities Engineering Command. N02470-68-C-0016.
—United Aircraft, Hartford, Conn. \$4,785,982. Design, fabrication and test of the JTF10A-32C engine. Naval Air Systems Command. N00019-69-C-0120.
—All American Engineering Co., Wilmington, Del. \$3,121,000. Spare parts for land-based arresting gear. Naval Air Engineering Center, Philadelphia, Pa. N00156-69-C-0611.
—United Aircraft, Hartford, Conn. \$2,018,488. Spare parts to support J52/57/34/36/36A aircraft engines. Aviation Supply Office, Philadelphia, Pa. N00383-8-69-000A-AF704.
—Peterson Construction Co., Lakeland, Fla. \$2,728,004. Improvement of the sewage treatment plant. Marine Corps Base, Camp Lejeune, N.C. Naval Facilities Engineering Command. N02470-68-C-0547.
—Aero Corp., Lake City, Fla. \$2,021,200. Progressive aircraft work on P-2 aircraft. Naval Air Systems Command. N00010-69-C-0186.
—Gulf Construction Building & Supply Co., Mobile, Ala. \$1,476,600. Construction of 100 family housing units. Naval Auxiliary Air Station, Whiting Field, Milton, Fla. Naval Facilities Engineering Command. N02467-67-C-0751.
—Virginia Electronics Co., Falls Church, Va. \$1,112,067. Manufacture of Romeo
- Eight secure voice networks. Naval Electronics Systems Command. N00039-68-C-1571.
—Hughes Tool Co., Culver City, Calif. \$1,085,464. Repair parts for 20mm, MK 4, gun pods. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-A-0006-209.
- 18—Lockheed Aircraft, Burbank, Calif. \$4,380,000 (contract modification). Change of P-3B aircraft to YP-3C configuration. Naval Air Systems Command. N00019-68-C-0043.
—Lockheed Aircraft, Marietta, Ga. \$1,740,000 (contract modification). Increase the limitation of authorization for EC-130 aircraft. Naval Air Systems Command. N00019-67-C-0266.
—General Electric, Syracuse, N.Y. \$2,193,052. Mine detecting/classifying sonar sets. Naval Ship Systems Command. N00024-69-C-1055.
—Lansdowne Steel & Iron Co., Morton, Pa. \$2,000,000. MK 50, MOD 0, projectiles for five-inch guns. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0057.
—Jacobsen Construction Co., Salt Lake City, Utah. \$1,767,000. Construction of 100 family housing units at the Naval Ammunition Depot, Hawthorne, Nev. Naval Facilities Engineering Command. N02474-67-C-1158.
—Philco Ford Corp., Fort Washington, Pa. \$1,623,411. Furnishing of supplies and services to refurbish and improve ship-board sonar equipment. Naval Ship Systems Command. N00024-69-C-1132.
—General Electric, West Lynn, Mass. \$1,063,920. ASN26 flight reference system components. Aviation Supply Office, Philadelphia, Pa. N00383-67-A-1101-0290.
- 19—Collins Radio Co., Newport Beach, Calif. \$8,474,999. Production of generators and ancillary equipment. Naval Electronic Systems Command. N00039-68-C-3507.
—Webb Corp., Phoenix, Ariz. \$5,885,143. Construction of 380 family housing units at the Marine Corps Air Station, Yuma, Ariz. Naval Facilities Engineering Command. N02473-67-C-3174.
—Continental Heller Corp., Sacramento, Calif. \$4,277,000. Construction of an aircraft maintenance hanger at the Naval Air Station, Lemoore, Calif. Naval Facilities Engineering Command. N02474-67-C-0725.
—Deep South Construction Co., Montgomery, Ala. \$3,180,000. Construction of an outlying field at the Naval Air Station, Meridian Miss. Naval Facilities Engineering Command. N02461-67-C-0560.
—Trader Construction Co., Havelock, N.C. \$1,342,500. Construction of a mess hall at the Marine Corps Air Station, Cherry Point, N.C. Naval Facilities Engineering Command. N02470-8-C-0082.
- 20—Canadian Commercial Corp., Ottawa, Ontario, Canada. \$17,112,445. Twin power section turboshaft engines for AH-1J and UH-1H helicopters. Naval Air Systems Command. N00019-69-C-0125.
—Polaron Products, New Rochelle, N.Y. \$13,326,455. MK 82, MOD 1, conical bomb fin assemblies. Batesville, Minn. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0084.
—Straightline Mfg. Co., Cornwells Heights, Pa. \$13,293,816. MK 82, MOD 1, conical bomb fin assemblies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0085.
—General Motors, Goleta, Calif. \$2,241,563. Incremental funding to establish design, development, test proof and qualification of a warhead and exploder for MK 48, MOD 0, torpedoes. Naval Ordnance Systems Command. N00017-67-C-1218.
—Automated Terminal Services, Jamaica, N.Y. \$1,861,888. Freight terminal operations for the QUICKTRANS program. Navy Purchasing Office, Washington, D.C. N00600-69-C-0284.
- 24—Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$14,800,000 (contract modification). FY 1969 long lead time effort for A-6A aircraft. Naval Air Systems Command. N00019-68-C-0058.
—R. G. Webb, Inc., and Compac Construction Co., Long Beach, Calif. \$3,880,000. Construction of family housing at the Naval Station, Long Beach, Calif. Southwest Div, Naval Facilities Engineering

- Command, San Diego, Calif. N62473-67-C-3175
- Harrison Overseas Corp., Miami, Fla. \$2,284,000. Construction of a BOQ with mess at the Naval Base, Guantanamo Bay, Cuba Caribbean Div., Naval Facilities Engineering Command, San Juan, Puerto Rico NBY-84195.
 - Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$1,500,000. Advance planning design, and other work preparatory to conversion of the nuclear powered fleet ballistic missile submarine USS Sam Rayburn (SSBN-635) to C-3 Poseidon missile capability. Naval Ship Systems Command. N00024-69-0231.
 - General Precision Systems, Glendale, Calif. \$1,444,528. Engineering services to provide technical assistance during evaluation of MK 48 torpedo weapons systems Naval Ordnance Systems Command N00017-69-C-1201.
 - ESB, Inc., Raleigh, N.C. \$1,346,575. Production of MK 37 torpedo batteries. Naval Ordnance Systems Command N00017-69-C-1408.
 - Kellett Aircraft Corp., Willow Grove, Pa. \$3,776,256. Transportable calibration complexes for use in support of test and measuring equipment in the Fleet Marine Force. Headquarters, Marine Corps. M00027-69-C-0040.
 - 25—McDonnell Douglas Corp., Long Beach, Calif. \$4,500,000 (contract modification). Long lead time effort and materials to support FY 1969 procurement of A-4 and AT-4 aircraft. Naval Air Systems Command. N00019-67-C-0170.
 - RCA, Camden, N.J. \$2,224,223 (contract modification) Operations and maintenance of instrumentation at the Atlantic Fleet Range Support Facility for a twelve-month period. Naval Air Systems Command. N00019-67-C-0341.
 - Hayes Construction Co., Brunswick, Ga. \$1,537,476. Construction of an air traffic control school training building at the Naval Air Station, Glynnco, Ga. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. N62467-67-C-0460.
 - Newport News Shipbuilding & Dry Dock Co., Newport News, Va. \$1,500,000. Advance planning, design and preparatory work in the C-3 Poseidon missile conversion of the fleet ballistic missile nuclear powered submarine USS Tecumseh (SSBN-628). Naval Ship Systems Command. N00021-69-C-0216.
 - 26—General Dynamics, Pomona, Calif. \$24,016,020. FY 1969 funding for production of medium range standard missiles and extended range standard missiles. Naval Ordnance Systems Command. N00017-67-C-2107.
 - Westinghouse Electric, Baltimore, Md. \$2,600,000. Production of materials and effort necessary to furnish complete production prototype models of Special Exercise Sections (Techeval) and (Opeval) for MK 48 torpedoes. Naval Ordnance Systems Command. NOW (H) 64-0751.
 - Spartan Corp., Jackson, Mich. \$1,557,280. Sonobuoys. Naval Air Systems Command. NOW 66-0952.
 - 27—Maxon Electronics Corp., Macon, Ga. \$5,989,000. Base fuses for the 5-inch 38-cal. loading program. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0041.
 - General Motors, Milwaukee, Wis. \$4,084,000. Time fuses for 5-inch 54-cal. loading program. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0037.
 - 30—Norris Industries, Los Angeles, Calif. \$3,407,500. MK 16, MOD 1, rocket tubes for 6-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0097.
 - Columbus Milpar Mfg. Co., Columbus, Ohio. \$3,143,000. Nozzle and fin assemblies for 6-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0080.
 - General Precision Systems, Little Falls, N.J. \$2,266,722. Equipment for the ASN-84 navigational system used by P-3C aircraft; \$2,002,460. Equipment for ASN-84 navigational systems. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-3201-0059 and N00383-68-A-3201-0058.
 - Alcan Aluminum Co., Riverside, Calif. \$1,760,850. MK 16, MOD 1, rocket motor

tubes for 6-inch Zuni rockets Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0092.



DEPARTMENT OF THE AIR FORCE

- 4—Honeywell, Inc., Hopkins, Minn. \$2,852,880. Production of metal parts kits for aerial bombs. Armament Development and Test Center. F33657-69-C-0265.
- National Lead Co., Toledo, Ohio. \$1,443,280. Production of metal parts kits for aerial bombs. Armament Development and Test Center. F33657-69-C-0266.
- Boeing Co., Wichita, Kan. \$18,921,593. Modification of B-52 aircraft to improve the flight control systems. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
- 5—Superior Steel Ball Co., New Britain, Conn. \$2,131,601. Production of non-explosive munition components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0311.
- General Motors, Indianapolis, Ind. \$1,250,000. Development work on an advanced turbine-engine gas generator. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0363-P003.
- ITT Corp., Nutley, N.J. \$1,177,029. Production of spare parts for a radio navigational system. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F33657-67-C-0524.
- LTV Electrosystems, Inc., Greenville, Tex. \$1,477,650. Modification of prototype EC-121T aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606-69-C-0127.
- 6—Garrett Corp., Phoenix, Ariz. \$2,393,693. Production of gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34001-68-C-3886.
- General Electric, Utica, N.Y. \$8,029,500 (increment to an existing fixed-price contract). Production of airborne electronic counter measure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0664-P009.
- Chicago Aerial Industries, Barrington, Ill. \$2,113,023. KS-87B camera systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-0243-P017.
- Bendix Corp., North Hollywood, Calif. \$7,674,783. Production of airborne radar equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-0367-P011.
- 9—Rand Corp., Santa Monica, Calif. \$12,000,000. Studies and research on aerospace power. Office of Scientific Research, Washington, D.C. F44620-67-C-0045.
- Bendix International, New York, N.Y. \$2,868,164. Radar sets. Towson, Md. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F4606-69-C-0301.
- Raytheon Co., Waltham, Mass. \$1,950,750. Electron tubes. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-A-0327-0002.
- Analytical Services, Falls Church, Va. \$1,500,000. Analytical studies pertaining to the application of weapons systems. Office of Scientific Research, Washington, D.C. F44620-69-C-0014.
- Philco-Ford Corp., Fort Washington, Pa. \$1,393,708. Operation, maintenance and modification of large aperture seismic array facilities Billings and Miles City, Mont. Electronics Systems Command, (AFSC), L. G. Hansom Field, Mass. F19628-68-C-0401.
- 11—Crescent Production Products, Garland, Tex. \$4,691,568. Production of bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0340.
- Chromalloy American Corp., San Antonio, Tex. \$1,612,263. Repair and application of protective metallic coating on J67 and J76 compressor blades. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-68-D7 1617-0008.
- 13—Hoffman Electronics Corp., El Monte, Calif. \$2,136,875. Production of air navigation equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0195.
- 16—ITEK Corp., Palo Alto, Calif. \$6,127,743. Production of components and assorted ground equipment in support of AN/APR-25 and 26 radar and warning systems; and components for AN/APR 736/37 radar systems. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F04606-67-A-1818.
- Hayes International Corp., Birmingham, Ala. \$4,539,167. Production of aerial tow targets. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F41608-68-A-6676.
- Aerodex, Inc., Miami, Fla. \$7,636,218. Overhaul of R4360 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-69-D-0245.
- 17—Sargent-Fletcher Co., El Monte, Calif. \$5,235,161. Production of fuel tank assemblies for F-4 and RF-4 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69-D-0226 0001.
- United Aircraft, Hartford, Conn. \$1,999,837. Production of spare parts for J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N393-69-000A.
- 19—AirResearch Mfg. Co., Phoenix, Ariz. \$1,258,444. Overhaul of gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-D-1328.
- Thiokol Chemical Corp., Huntsville, Ala. \$1,875,509. Motors for the Athena II missile program. Space & Missile Systems Organization, (AFLC), Los Angeles, Calif. F04701-68-C-0182.
- 20—Boeing Co., Wichita, Kan. \$3,236,406. Services to accomplish depot level modification on B-52 aircraft for FY 69. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-C-4653.
- North American Rockwell Corp., Tulsa, Okla. \$7,401,000. Inspection and repair of air-to-ground missiles. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-0082.
- 23—Batesville Mfg. Co., Camden, Ark. \$2,160,000. Bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-1071.
- Aerojet-General Corp., Sacramento, Calif. \$1,659,000. Production of components for the Genie rocket. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F04606-68-A-0068-QP11.
- McDonnell-Douglas Corp., Long Beach, Calif. \$1,500,000. A model ejection seat development program. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0223.
- General Electric, Bethesda, Md. \$1,118,600. Rental of electronic data processing equipment. Procurement Div., Offutt AFB, Neb. F25600-69-M-1628.
- 24—Honeywell, Inc., Hopkins, Minn. \$9,984,000. Production of bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0291.
- Lifton Systems, Inc., Woodland Hills, Calif. \$1,667,539. Production of aerospace ground equipment for the inertial navigation system applicable to the RF-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-1526-0004.
- Perkin-Elmer Corp., Norwalk, Conn. \$1,350,000. Production of a camera system for the RA-5C aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69-C-0839.
- 25—Fairchild Hiller Corp., Gormantown, Md. \$6,000,000 (contract modification). Repair and modification of C-119 aircraft. F09603-68-C-1633 POOD 0043 & 0049. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
- Aero Corp., Lake City, Fla. \$3,793,022. Maintenance and modification of C-124 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-

- 69-C-0027.
- Marwaits Steel Co., Richmond, Calif \$2,481,390. Production of aircraft reventments. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0738-P001
 - Cullman Metalcraft, Cullman, Ala. \$2-771,613. Production of bomb components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615-69-C-0167.
 - Cessna Aircraft Co., Wichita, Kan. \$3-500,000. Engineering and modification services, spare parts and data for 0-2A aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1224.
 - 26—United Aircraft, East Hartford, Conn. \$1,210,386. Production of spare parts for J57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
 - 27—General Electric, Philadelphia, Pa. \$3,700,000 (increment to a previous contract). Research and development of MK 12 re-entry systems. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif AF 04-(694)-731.
 - Hayes International Corp. Birmingham, Ala. \$3,133,237. Maintenance and modification of C-121 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0028.
 - 30—United Aircraft, Windsor Locks, Conn. \$4,717,704. Production of payload transports for Minuteman II and III missiles. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0156.
 - Texas Instruments, Dallas, Tex. \$2-846,672 (increment to an existing contract). Manufacture of components for infrared detecting sets for RF-4C aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0379-P004.
 - AirResearch Mfg. Co., Phoenix, Ariz \$2,000,000. Gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-D-0803
 - Collins Radio Co., Cedar Rapids, Iowa. \$1,298,004. Engineering, fabrication and installation of modification kits for an improved avionics system for VC-137 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-A-2513.
 - Mitre Corp., Bedford, Mass. \$19,455,670. Research and development for system design, engineering, inter-system integration, and research and experimentation to achieve continuing advances in the field of information and communication systems. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628-68-C-0365.

Standardization Documents

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tors of the responsibility for application of specifications of appropriate date in complying with defense contracts.

Subscription requests for new and revised specifications and standards may be forwarded to the Director, Navy Publications and Printing Service Office, Building 4, Section D, 700 Robbins Ave., Philadelphia, Pa. 19111. Each request should be accompanied by a certified bank check or postal money order, payable to the Treasurer of the United States, covering an annual subscription by class computed at \$4.50 for each class the subscriber desires.

Distribution will be made of copies in printed form. Subscribers will receive only new or revised documents printed after the effective date of the subscription. Documents printed prior to an effective subscription date must be ordered on an individual document basis, using DD Form 1425. New and revised specifications and standards are automatically distributed to subscribers within five days of receipt at NPFC Philadelphia.

General Information

Some other points of information, concerning the distribution of specifications and standards from NPFC Philadelphia, are:

- Current amendments and revisions will be automatically issued with the basic specifications requested.

- Only documents requested by number will be furnished. Referenced documents must be requested by individual document number, when required for contract execution.

- Slash sheets, such as MIL-E-1/

306B, must be individually requested by document number.

- Industry standards should be ordered from the preparing technical societies, not NPFC Philadelphia.

- NPFC Philadelphia stocks only those specifications and standards listed in the DODISS.

- NPFC Philadelphia does not maintain a file for invitations for bid, requests for quotes, contracts, etc., so a list of each individual document required by document symbol must be submitted.

- Documents issued by NPFC Philadelphia are in printed form only.

- Only latest issues of specifications and standards listed in the DODISS will be furnished.

- Canceled (or superseded) specifications are not stocked at NPFC Philadelphia. Copies of canceled documents required in fulfillment of contractual obligations may be obtained from the Director, Navy Publications and Printing Service Office (NPPSO-4ND), Philadelphia, Pa. 19111, upon certification of the need by the applicable contracting officer.

To expedite deliveries of material to customers, a mechanized material warehousing and packing system is used. NPFC Philadelphia has approximately one and one-half miles of mechanized conveyor which is monitored by a programmer from an electronic console. Through this console the programmer regulates an even flow of work to and from all operating areas.

Every effort is made to provide maximum service to private industry and to satisfy each and every customer.

FX-VFX Engine Contracts Awarded

Contracts totaling \$100 million in value have been awarded by the Air Force for initial development of a high performance afterburning turbofan engine suitable for use by the Air Force FX air superiority fighter and the Navy VFX advanced fighter.

Letter contracts and initial obligations of \$11 million each have been given to the Pratt and Whitney Division, United Aircraft Corp., Palm Beach, Fla., and the General Electric Co., Evendale, Ohio.

Under terms of the contract, each company will develop and test a prototype engine based on the technological level demonstrated by the lift/cruise engine development program.

The 18-month initial engine development program is jointly funded by the Navy and the Air Force.

The FX program is under the direction of Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio. Colonel Robert White is the program director.

Changing Address?

The *Defense Industry Bulletin* converted to a computer-prepared mailing list a few months ago. Now, when requesting a change in address or a deletion, subscribers must send the mailing label from the back cover of the magazine. Without this label, changes in address or deletions cannot be effected. Changes and labels should be sent to the Editor, *Defense Industry Bulletin*, OASD (Public Affairs), Room 1E764, The Pentagon, Washington, D.C. 20301.

OFFICIAL BUSINESS

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Fly-by-Wire System Tested by Air Force Systems Command

"Fly-by-wire?" No, it is not a circus trapeze act. It is actually a unique and reliable way to fly fast modern aircraft that is now under study by the Air Force.

The system is based on the use of electrical and electronic signal wires in place of mechanical links between a pilot's stick and control surface actuators.

Test flights of the system are being conducted by the Air Force Systems Command's Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio. First phase of the program, consisting of test flights of a single-axis (pitch) fly-by-wire system on a B-47 aircraft, has already been successfully completed.

The fly-by-wire system is installed parallel with the aircraft's mechanically operated system. A non-redundant servo-operated hydraulic actuator is connected to the elevator of the B-47, and receives electrical signals from position transducers connected to the pilot's control stick.

A pilot has the same sense of feel when flying the B-47 fly-by-wire control system as he does when using a mechanical linkage system, since he is connected to the same artificial feel system. The mechanical system is not disconnected, but is used as a safety backup. In the fly-by-wire mode the mechanical system is bypassed, and the electrically controlled servo actuator operates the elevator.

Purpose of the testing program is to develop a control system that can meet the demands of advanced vehicles. Mechanical linkages, cables and feel springs, that are part of a manual system, cannot adequately handle control problems of advanced high performance aircraft and aerospace vehicles. The fly-by-wire system increases flexibility and reliability of aircraft controls as well as decreasing its complexity, weight, volume and cost.

The second phase of the program calls for the aircraft to be equipped with a side-stick controller for the pilot, with a closed loop feedback system so that the pilot directly controls movements of the aircraft and has the necessary feel-response from the controls.

Army Lab Gets New Nuclear Research Capability

A \$4 million Tandem Van de Graaff Accelerator, the only nuclear research tool of its kind with the U. S. defense establishment, is now operational at the Army Nuclear Defense Laboratory, Edgewood Arsenal, Md.

The laboratory will use the new accelerator to conduct both basic and applied research. The new facility can accelerate a wide range of nuclear particles to energies at which nuclear reactions can be studied.

Under construction since July 1967, the accelerator was built by the High Voltage Engineering Corp., Burlington, Mass. Its shelter was provided by Henry A. Knott, Inc., Baltimore, Md.

The Nuclear Defense Laboratory conducts research in nuclear weapons effects including initial radiation, residual radiation and fallout, shielding, and thermal radiation phenomena. Formerly under direct administrative control of the Army Materiel Command, the laboratory now reports to the Research and Development Center, Aberdeen Proving Ground, Md. Dr. Donald Eccleshall is acting technical director of the laboratory.

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Sizeable for industry representatives concerning possible opportunities for defense work and for forwarding to the Editor of the *Bulletin*.

The *Bulletin* is directed by the Office of Charge to qualified representatives of industry and of the Department of Defense, Army, Navy, and Air Force. Submissions should be submitted on company letterhead stating clearly the position of the author and be addressed to the Editor, Defense Industry Bulletin, OASD (PA), Pentagon, Washington, D. C. 20301.

Contents of this magazine may be freely reprinted. Mention of the source will be appreciated.

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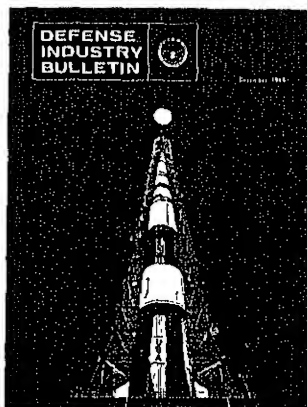
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Like a space age Christmas tree, the Saturn booster and the Apollo vehicle stand in the gantry ready for launch. DOD support of the Apollo program is told on the back cover.

Technical Performance Measurement— A Defense Department View

Dr. Norman Waks

The term "Technical Performance Measurement" (TPM) stirs up a great deal of emotion, misconception, and some outright hostility on the part of industry and Defense Department people. The purpose of this article, therefore, is to attempt to define what TPM is, why it is needed, what is being done both to achieve effective "measurement" of technical performance in major programs, and to relate this measurement to the measurement of cost and schedule performance.

At the outset, it should be pointed out that TPM is only one part of the larger subject area of project technical management with which the Office of the Director of Defense Research and Engineering (ODDR&E) is involved. To put things in even broader context, project technical management, in turn, is only a part of total project planning and control with which all elements of the Office of the Secretary of Defense are concerned. Thus this article treats only a small, but important, part of the field of project management: that part which asks how a project is doing in terms of its intended technical goals.

A major share of ODDR&E's management activity is devoted to a continuing search for ways to improve project technical management, whether it be in industry or in DOD. ODDR&E is engaged in a variety of activities in this field, some of which will be mentioned later. These activities need to be related, one to another,

in a way which is both meaningful and beneficial. So an attempt is made to represent the entire defense research and development community—both Government and industry—in the various policy discussions that take place in the Office of the Secretary of Defense by synthesizing the various pieces of the larger picture. In particular, ODDR&E got heavily involved in TPM because of its recognition of the serious differences of opinion within the defense research and development community concerning the state of the art of technical performance measurement. Some companies, and people in DOD, seemed to feel that such a task was easy. Others said it was impossible. Even divisions of the same company disagreed strongly. The truth is probably somewhere between these two extremes. Certainly the job is a very tough one—in fact, in the opinion of many, an order of magnitude more difficult than providing for cost and schedule performance measurement. It is not, however, an impossible task and continued attention must be paid to striving for improvement in the area.

Many companies have already put considerable effort into searching for better ways to do the TPM job, both for its own sake and for purposes of better relating this technique to the measurement of cost and schedule performance. The Defense Department is strongly encouraging such effort. In effect, technical performance control is considered the third leg of the program management control "stool" together with cost and schedule control; and when it is not the same length as the other two legs, it is inevitably the one which "gives" when pressure is applied to the program (or seat of the stool).

Regardless of how much effort has been expended to date, nobody as yet seems to have found a completely satisfactory approach to integrated performance measurement: the direct, one-to-one relating of all three program parameters (cost, schedule and

technical) as a program progresses. The technical community appears, in fact, to be facing a long-term job here which can only be accomplished incrementally, building—as is normally done in research and development—on each piece as it moves ahead in its understanding. ODDR&E sees its role in this job as primarily that of actively encouraging industry to do, as rapidly as possible, a job it believes industry needs to do for its own sake and which, in turn, will benefit DOD. It is realized that this job is essentially a creative design job and, therefore, needs to be done at a pace which makes sense—not one in which results are scheduled in advance. ODDR&E intends to hold to such a pace.

Technical performance measurement has been defined by a variety of sources, but there is still much uncertainty as to what is really meant by the term. There is no single definition used throughout DOD or industry. For purposes of this article, and as the basis for reaching broader understanding and agreement, TPM will therefore be defined as:



The regular demonstration through test, or prediction through extrapolation or other forecasting technique, of the degree of actual or anticipated achievement of selected technical goals or objectives of a system, subsystem, component, or equipment program/project, and an accounting, in the causal sense, for the difference between the results of this status reading and that which was planned (what some call "variance analysis") in a fashion which permits appropriate managers to take timely action on indicated problems.

The "goals" and "objectives" here will be specifications in the contract or other master work order, supplemented by the work performer's own goals and objectives as he further shreds out the work to be accomplished by his engineering effort. These goals and objectives are the baselines against which measurements are taken in a TPM effort. In turn, however, they may have to be changed as a result of these very measurements. Hence there is a very close tie between TPM and the systems engineering effort which provides and revises specifications on a program.

Now, obviously everyone in the research and development business has been doing technical performance measurement in one way or another since he started in the business. What is it, then, that ODDR&E is trying to encourage now that is different from what the technical community has been doing all along? Three goals might be listed here:

- Acceleration by the technical community of efforts to improve the means by which it measures, predicts and analyzes variances in technical accomplishment. As the consequences of deviation from planned program goals become greater and greater, technical managers must know increasingly earlier and more accurately the "what" and the "why" of actual or anticipated deviations, if they are to have any hope of taking adequate and timely corrective action on undesirable ones.

- Improvement of the means by which the technical community regularly relates technical objectives and accomplishments to cost and schedule objectives and accomplishments. In a military environment, promised technical capability has little meaning for

decision makers without the knowledge of when they can really have it (schedule) and what they must give up to get it (cost).

- Improvement of the way in which actual and planned technical performance is presented to management at the various organizational levels. The data, at the moment, is just not meaningful enough.

One specific area in which a lot of thinking is needed with regard to improvement in performance measurement, for example, is that of the non-hardware parts of a technical effort, like systems integration, engineering analysis, and design validation. These parts of the effort are accounting for an increasing proportion of current development contracts, especially in the case of those companies which do not charge prototype fabrication to "development."

There are deficiencies even on the more hardware-oriented type of activities, incidentally, such as the design synthesis effort leading to a prototype. In this area it is doubtful whether most contractors can now apply TPM techniques sufficiently well so that the numbers fed into the system at the working supervisor level are considered reliable enough even by them to be used as a basis for decision.

DOD impetus to seek improvements in technical performance measurement and its relationship to cost and schedule objectives and performance was given by publication in December 1967 of DOD Instruction 7000.2, titled "Performance Measurement for Selected Acquisitions." The instruction requires contractors to meet certain criteria for their performance measurement systems on selected contracts. These criteria are intended to apply not only to cost and schedule performance, but to technical performance as well. In this regard, although there have been and still seem to remain some substantial differences of opinion regarding what constitutes good cost and schedule control systems, there is, as already indicated, even more widespread concern and misunderstanding regarding a good technical performance control system. The publication of the instruction brought some of these concerns and misunderstandings to the surface. Therefore, Dr. Finn Larsen, the Deputy Director of Defense Research and Engineering, and Dr.

Robert Anthony, then the Assistant Secretary of Defense (Comptroller), agreed that clarification of several sections of the instruction was required. This clarification was provided, on an interim basis, in a joint memorandum issued on May 21, 1968. These and other needed improvements which have been identified are now being incorporated in a revision to the instruction. Once completed, work will proceed on the Guide called for by the instruction. Even before the Guide is issued, however, approval for application of provisions in the current instruction can be obtained on a case-by-case basis.

The Larsen/Anthony memorandum should have helped a lot to improve understanding of DOD's intentions in the technical performance measurement field. The memorandum also served to express the way in which DOD intends to get at this business of performance measurement. It said in this regard that DOD intends to interpret and implement DOD Instruction 7000.2 on performance measurement "with an experimental attitude, with a common sense consideration for the practical problems



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The author gratefully acknowledges the assistance of Harold M. Wakefield, Staff Assistant, in the preparation of this article.

involved, and with the expectation that both the department and industry will work hard at the task of devising better ways of measuring and relating technical effort in the management systems by which major acquisitions are controlled." Parenthetically, it should be noted that ODDR&E intends to follow this approach not just in connection with performance measurement, but on any technical management policy that it promulgates.

One of the more important points that was made perfectly clear in the memorandum is that no contractor is going to be prohibited from doing business with DOD for failing to have a technical performance measurement system that will operate in a completely integrated, traceable fashion with cost and schedule—at least for the foreseeable future. The reason for this is that admittedly DOD does not yet have proven methods by which to provide or administer a set of unambiguous standards for measuring the acceptability of a contractor's technical performance measurement system.

Further, although DOD recognizes that there is a definite interaction between the three program parameters, the present state of the art does not warrant strict insistence on a contractor's performance measurement system being capable of either immediately or directly showing the effects on the other two parameters, when one of the parameters changes. This is why the memorandum limited the definition of the word "integrated," used in DOD Instruction 7000.2, to mean only that cost, schedule and technical performance measurement must be made against a common work breakdown structure (WBS): the contract WBS. Even here, the whole WBS need not be involved, but only those selected elements (and their related technical parameters) on which overall program success most depends. We need to identify these critical elements and their related technical parameters for the sake of program test planning (and possibly multiple incentive contracting) in any case.

While contractors will not be barred from supplying the Defense Department because of failure to have a technical performance measurement system which meets fixed, pre-established standards, all contractors are being encouraged to work just as

hard as they possibly can in the development of "reliable, integrated systems for measuring technical performance." In this regard, it is recognized that such an effort will require the attention of industrial top managements if it is to get adequate support and resources. To stimulate this top management attention, the Office of the Secretary of Defense will encourage the Military Departments to make an integrated performance measurement system a source selection factor in all contracts subject to the criteria of DOD Instruction 7000.2. This is being done because it is believed *relative* judgments by DOD are possible on the merits of the performance measurement systems of competing contractors (confirmed by a later validation effort), even if *absolute* judgments cannot be made. Another possible industry motivating device might be that of providing direct incentives within a contract. Undoubtedly there are other ways which can be identified as the effort moves ahead. Ideas on this topic will be most welcome to DOD.

A word now about the intended application of technical performance criteria. These criteria, when developed, will be applied in the same kinds of programs and contracts as will the new cost and schedule criteria. This means that only major projects, and major contracts within these projects, will be directly affected. As a further general rule, DOD expects to apply standards or criteria for technical performance measurement in a quite selective fashion. In this regard, the chances of successful application of the technique are better the farther along in

development a program is, and where technical uncertainties are sufficiently low to warrant the use of fixed-price type contracts. Therefore, application of the criteria is proposed first to operational system developments under fixed-price incentive contracts. As we learn, the criteria will then be extended to engineering development efforts. Finally, they may possibly be applied to cost-type contracts. However, if the technical uncertainty in the program is of such a magnitude as to require the Government to contract on a cost-type basis, then it is difficult to see how an integrated performance measurement system involving specific, pre-established performance standards and the measurement of deviation from these standards can be required, however desirable.

For reasons described earlier, the DOD effort in technical performance measurement is directly related, by necessity, to the DOD effort in defining systems engineering and how it should be managed. For example, the Air Force has developed a draft military standard on systems engineering management which requires a technical performance measurement system of *some* type as part of a contractor's so called "System Engineering Plan." After ODDR&E has evaluated this Air Force standard (whose creation the Army and the Navy actively observed), steps may well be taken to use it as a basis for the development of a tri-Service military standard.

In addition to the Air Force systems engineering management stand-

(Continued on page 17)

Technical Performance Measurement--A Selective Application

- Major development contracts within costly programs:
 - Operational systems developments before engineering developments.
 - Fixed price incentive contracts before cost type contracts.
- Critical work breakdown structure elements within major contracts.
- Key technical parameters within critical work breakdown structure elements.

BUSH Sales Aid Contractors and Government

Lieutenant Colonel Felix H. Jewell, USAF

Mrs. Jane Litchfield

BUSH Means Buy United States Here— but "Here" is Overseas

The history of the BUSH program began in mid-1962 when the Secretary of Defense directed an intensified program to reduce DOD expenditures entering the international balance of payments for materials and supplied for use outside the United States. The program placed increased emphasis on the use of U.S. origin items in support of overseas activities of the Defense Department.

When the intensified Buy United States policy was implemented, the cost of procuring American-made products in the United States for overseas delivery was increased. There were government surcharges, export packing charges, insurance fees, and the cost of transportation from the United States. These costs

had to be absorbed by the purchasing agency. Even more important to mission-conscious commanders, delivery times for items previously bought overseas greatly increased. When material had been procured overseas, lead-times were short and there were minimum transportation, maintenance and spare parts problems.

While looking for ways to solve these problems of increased cost and slow delivery and still effectively support the Buy United States policy, overseas procurement officers found that many American firms had agents, subsidiaries and affiliates in Europe, with large stocks of U.S.-made supplies in bonded warehouses, from which they supplied their commercial markets. These suppliers were ready, willing and able to contract for delivery of their products direct to U.S. Government activities in Europe, North Africa and the Near East. Further study revealed

that many of these companies could deliver FOB overseas destinations at prices equal to or below the prices paid in the Continental United States (CONUS) possibly due to lower sales, marketing and labor costs, and the fact that U.S.-made items imported for delivery to U.S. Government agencies, or delivered from customs bond to U.S. Government agencies, are exempt from import duties and taxes.

The BUSH program was devised to take advantage of these situations. BUSH was originally initiated by the U.S. Air Forces Europe (USAFE) on an experimental basis in March 1963. Pacific Air Forces (PACAF) awarded its first BUSH contract in November 1964. The program continues to grow annually.

Operational BUSH offices are geographically dispersed in order to be closer to the affiliates of U.S. companies. Organizations presently negotiating, awarding and administering BUSH are listed in Figure 1.

All U.S. Government agencies located within authorized countries, such as Army, Navy, State Department (embassies and consulates), Agency for International Development, American Battle Monuments Commission, Department of Commerce, etc., including all their non-appropriated fund activities, are authorized and have used BUSH contracts because of the immediate availability of goods and lower costs. In addition to the government organizations, government contractors performing under cost reimbursement contracts may order from BUSH contracts. The countries covered by the contract are a negotiable factor, although the Government's objective is to obtain as much coverage as possible. Additional countries may be authorized as the need arises.

All U.S. manufacturers of commercial products or their affiliates are

BUSH Contracting Offices

Address	Location
Pacific:	
PACAF BUSH Procurement Office— Japan (DMP-BJ) APO San Francisco 96328	Tachikawa Air Base Tokyo, Japan
PACAF BUSH Procurement Office— Philippines (DMP-BP) APO San Francisco 96528	7th Fl. Amalgamated Dev. Corp. Bldg. Ayala Avenue, Makati, Rizal, Philippines
Europe:	
USAF Purchasing Center, Germany (UPOG) APO New York 09332	Wiesbaden Air Base Wiesbaden, Germany
USAFE Purchasing Center (UK) Box 32, FPO, New York 09510	Keysign House London, England

Figure 1.

solicited to negotiate BUSH contracts. The only criterion for a BUSH contract is that the prices and delivery times for the U.S. end products must offer advantages to the Government over concurrently existing methods of obtaining these same type of commodities from the United States.

Contracting Procedure

The key program element is a firm fixed price, indefinite quantity contract which is executed either with the overseas affiliate of an American firm, or directly with the domestic company. The contractual period is for one year.

BUSH contracts contain two main parts. The first part consists of the contract schedule and the contract clauses. The second part of the contract is an attachment called the Authorized Price List (APL) and consists of all information required by ordering activities to place orders against the contract, the price list, and descriptive or technical data regarding the products. Contractors are encouraged to use commercial catalogs for the descriptive and technical data. The APL is printed and packaged by the contractor, and delivered to the BUSH Procurement Centers for distribution to ordering activities in the field. In some instances the contractor may be provided pre-addressed government mailing labels which enable him to mail APLs direct to ordering activities through the APO system. No postage is required in these cases.

Under the BUSH concept, orders are placed directly by the overseas procuring activity with either the domestic contractor or his overseas affiliate. The contractor then delivers to the overseas destinations, at a price which does not exceed FOB CONUS prices. Landed prices in Europe must not exceed the overseas destination delivered price of CONUS items.

Payments for items ordered against BUSH contracts are made by U.S. dollar checks, direct to the firm or to a bank in the United States.

Contractors are asked to submit, along with their proposals, copies of any existing government contracts for the products they propose for a BUSH contract, GSA Federal Supply Schedules, or published commercial or government price lists. In the absence of these, contractors may be

Growth of BUSH Contracts

FY	Contracts	Expenditures
63	3	\$ 154,000
64	23	600,000
65	45	3,000,000
66	75	9,000,000
67	74	13,000,000
68	90	20,500,000
69	110*	30,000,000*

* Estimated

Figure 2.

requested to submit cost or pricing data. Item pricing for a BUSH contract is all inclusive, and may incorporate such things as packing and preservation costs, standard government-required features, such as radio interference suppressors, installation of, and operator training for equipment, and a service period for company-installed equipment and machines. Quantity discounts are indicated separately.

Commercial, off-the-shelf products for which there are recurring requirements and which are usually purchased by procurement activities of overseas U.S. Armed Forces are suitable for inclusion in BUSH contracts. Contracts also have been written for rental of U.S.-manufactured equipment. Examples of products currently under contract are: office machines of all types, special paints, construction materials, upholstery fabrics, recording tape and equipment, cleaning materials and solvents, motor vehicle chemicals, light bulbs, background music and sound systems, graphic products, and reflective products.

There are some limitations as to the kind of items which can be placed on BUSH contracts. The following products are excluded from the BUSH Program:

- Items stocked by the General Services Administration (GSA) Stores Depots.
- Items covered by the GSA National Buy Program.
- Items for medical use.
- Items that affect safety of flight.
- Items that require quality assurance inspection by the Government.
- Items that are of a strictly military nature.
- Items that are assigned to the U.S. Army-Europe under Single Service Procurement Assignment Procedures. (Such products are vehi-

cles and vehicle spare parts, tires and tubes, plumbing fixtures and accessories, space heating equipment and water heaters, fuel burning equipment units, lumber and lumber products, millwork, household and office furniture, cabinets, lockers, bins, industrial gases, solid fuel, and subsistence.)

Delivery Methods

Another principal factor of the BUSH contract concerns delivery points. The mode of transportation is the contractor's concern, but he must deliver FOB overseas destinations. Four methods of contract deliveries are acceptable and any one, or a combination of the four, offering advantages to the Government may be used in an individual contract. They are:

- Direct overseas delivery to the orderer by the contractor.
- Delivery to foreign ports of debarkation (RODs) for U.S. Government acceptance and trans-shipment to a final destination.
- Delivery to a central overseas delivery point for U.S. Government acceptance and trans-shipment to final destination.
- Delivery through the U.S. Postal System direct to the designated APO/FPO of the overseas orderer for mailable goods.

The delivery schedule in BUSH contracts is one of the main advantages over normal procurement methods. BUSH contracts contain two separate delivery schedule provisions. The "Routine Delivery" schedule sets forth the maximum time allowed for delivery by the contractor. This maximum delivery schedule is necessary because of the various destinations and the multitude of items in the contract. The routine delivery schedule will always apply unless action is taken by the ordering office under the

second delivery provision, "Accelerated Delivery." In many cases contractors will have some of the items in the contract in stock and available for immediate shipment. The ordering office contacts the contractor and negotiates a shorter delivery schedule, which is then specified in the Delivery Order and becomes mandatory upon the contractor. Every effort is made to include realistic delivery schedules for each item in the Authorized Price List. Many U.S. companies have found that bonded warehouse arrangements in Europe are highly satisfactory in expediting delivery of high-usage items and for easier customs clearance. This type of arrangement is encouraged wherever possible; however, it is not a criterion for issuance of a BUSH contract.

An additional advantage of BUSH contracts is that the fulfillment of commercial warranties is completely practical as many companies have branch offices located throughout Europe and the Near East. The contractors' commercial warranty certificates, normally inclosed in the packing cartons, are controlled by appropriate military personnel who monitor the warranty period, and insure that servicing is performed in accordance with the terms of the contract. For those products for which no certificate is issued, contractors label the cartons or packages (usually by stenciling) so that the user will know

the products are covered by a warranty.

Advantage of BUSH Contracts

BUSH contracts offer an impressive list of advantages to the U.S. Government and to the contractor. Advantages to the Government include:

- FOB overseas delivery prices equal to or lower than prices for items bought in the United States and shipped overseas at government expense.
- As all BUSH contractors deliver to overseas destinations, overseas packing costs are eliminated or reduced through the use of commercial export packing.
- Reduction of U.S. Government costs due to overseas shipment losses, damages and pilferage since the contractor assumes liability for overseas shipments.
- Overseas warranties on U.S.-made equipment (not normally associated with CONUS-procured equipment) or lower unit prices where the companies have no overseas facilities.
- Reduced pipeline time for overseas deliveries, as many contractors pre-position their high-volume products in bonded areas overseas for quick delivery. Faster delivery increases supply effectiveness and decreases inventory needs. Faster delivery also permits smaller individual orders which allows improved local funds management.
- Overseas installation of equipment and check out by company trained technicians.
- Government personnel operator training conducted by the contractor at overseas locations.
- Stimulation of purchases of U.S. end products under \$500 which are now exempt under the overall Buy United States policy.
- Placement of orders by overseas activities direct to contractor's overseas locations, thereby reducing administrative delays in purchase request transmission and order placement time.
- Quick reaction time to emergency orders.

Advantages to the contractor include:

- Increased international exports and sales with improved foreign service. International organizations bene-

fit from sales and expected service of their equipment.

- Receipt of all overseas orders in a centralized office regardless of where the order is issued. Orders can be edited to reduce errors and corrected locally prior to shipment/delivery.

- Improved overseas support of contractor equipment since the final delivery destinations are known. Internal company planning for technician training needs and for prepositioning equipment, supplies and spare parts can be coordinated internally prior to their needs—a practical impossibility with the current CONUS procurement procedures.

- Identification of overseas ordering activities for the contractor. This information can be used to plan for future sales and service, office size at each location, and impending personnel requirement.

U.S. companies have been establishing themselves in the foreign areas at a rate of 600 to 700 a year for the past five years. The expansion and continued success of the BUSH Procurement Program seems assured if the majority of the U.S. companies now located or represented overseas participate in the program. This participation will be enhanced as the requiring and using activities advise the BUSH offices of products that may be susceptible to the BUSH Procurement Program.



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Small Business Administration Technology Utilization Program

Clyde Bothmer

[Editor's Note: This is the fifth in a series of articles contributed to the *Defense Industry Bulletin* by the Small Business Administration. Clyde Bothmer, the author, is Deputy Associate Administrator of the Small Business Administration.]

When the figures for FY 1968 are finally totaled, the research and development spending by all Federal agencies will probably amount to almost \$17 billion. Between FY 1957 and FY 1967, nearly \$100 billion were spent by the Federal Government for research and development in the programs of defense, space exploration, atomic energy, education, health and welfare, to name only a few; and the trend is upward. The work for which those dollars paid has produced over a million technical documents now in the possession of the various agencies, and available to the public.

When so much material with such a vast scope exists, one might suspect that buried in it may be some critically important technical breakthrough, equivalent in importance perhaps to xerography or the transistor, and it will never be sifted from its surroundings and recognized. While this may be unlikely, it is entirely possible that lesser developments, such as a technical improvement in a manufacturing process, might spring from the research and development funded by the taxpayers. If only 10 percent of the documentation owned by the Government had useful commercial potential, thousands of documents, having already served their intended purpose, would be available to the economy, in effect, without cost. This possibility is ample justification for government programs devoted to making Federal technical information available to industry and the general public. These programs, may be referred to under

the general heading of "technology utilization."

There are a number of active technology utilization programs. Four are of particular significance: those of the Defense Department, the National Aeronautics and Space Administration (NASA), and the Atomic Energy Commission (AEC), all of which are heavily involved in research and development; and the Office of State Technical Services of the Commerce Department which, like the Small Business Administration (SBA), is concerned primarily with providing information to potential users.

While all of these agencies do an excellent job of disseminating information, there are indications that small firms are not participating fully in the programs. For example, an examination of the industrial interest pattern in NASA *Tech Briefs*, conducted at the University of Maryland, indicated that a much higher proportion of large business than small business is taking advantage of the *Tech Brief* program. Reasons for this can only be deduced but two causes seem logical: most small businessmen are not aware of the *Tech Brief* program, perhaps having never seen the publication; and most small businesses lack the in-house technical capability to properly evaluate the potential or impact of a particular piece of new technology on present products or processes. Additionally, the simple communication of the information provides no guarantee that the business will benefit. The small business may lack the capability to act on information, even after receiving it. The small business may actually be overwhelmed by material available, unable to review, digest and evaluate the possibilities. Even if a small company has been able to evaluate the possibilities of a new piece of technical information, it may

still lack the capability to exploit that information. In other words, a new process or product may do a small company no good in the absence of the required capability in the marketing, production, management, or financial fields. The latter problems do not fall within the responsibilities of the agencies mentioned previously, but are definitely within the charter of SBA.

These considerations prompted SBA, with its varied programs of technical, financial, and management assistance, to establish a program which would complement existing technology transfer projects. In June 1967, SBA, on an experimental basis, created the Technology Utilization Division under its Office of Management Assistance. The division's mission is to tailor and implement an effective technology transfer and utilization program focused primarily on small manufacturing concerns. The planning phase is essentially complete, and implementation has begun. The program consists of three basic approaches: education, dissemination, and assistance.

Education

A great deal of emphasis is being placed on conferences, seminars and workshops on new technology, especially in the early phases of the program. Large conferences, staged in cooperation with NASA and AEC whenever possible, introduce selected audiences to new technology of commercial potential and to the ways and means of tapping the Government's accumulation of technological information. Seminars and workshops follow the conferences, at which time greater substance and definition are given to certain technologies or specific innovations. Attendees are manufacturers and entrepreneurs who have vital commercial interests in the particular subjects in question.

SBA works closely with universities and research institutes at the seminar/workshop level. SBA's technology utilization officers and the Service Corps of Retired Executives (SCORE) follow up and attempt to provide whatever assistance is necessary for the small businessman to capitalize on any interesting aspect or aspects of these training programs. (For a description of the organization and activities of SCORE see article, "Management Counseling for Small Business," *Defense Industry Bulletin*, September 1968, page 27.)

Five conferences, ranging in size from 100 to 500 attendees, were held during FY 1968. Either NASA or AEC, or both, co-sponsored three of these conferences and were responsible for the technical presentations. SBA took the lead on the other two conferences, cooperating with other agencies. SBA's role is one of explaining technical information programs and how these programs impinge upon and can facilitate the technology utilization process. In addition to these conferences, numerous seminars and workshops covering technical subjects, new product development and use of government sources of information have been conducted, often in cooperation with institutions participating in the State Technical Services Program.

Dissemination

Since so much information is distributed through other government programs, it seemed prudent for SBA to stay out of the mass dissemination activity. What was needed for small business was a program focused on the identification of potential new products and new processes in defined subject areas. Therefore, SBA has embarked on a modest publication program intended to fill this void. A series of booklets, perhaps as many as 10, will be issued in FY 1969. These publications will be subject oriented, draw material from government-wide sources, and contain abstracts of specific innovations. The SBA staff will attempt to select ideas with the best commercial potential and, wherever possible, to suggest a commercial application, despite the obvious problems in such a course.

The first publication was titled "Selected Advances in Electrical Technology." Released in March 1968, it was sent to top management of 17,-

000 small electrical and electronic manufacturers. Publications on metal joining and tooling have also been sent to managements of firms with interest in these topics. Other publications in process involve such subjects as instrumentation, and computer hardware and software.

Assistance

In the technical, managerial and financial areas, SBA is in a unique position and has the greatest opportunity to contribute to the technology utilization process. It is there that the most formidable barriers to the use of new technology exist, particularly for small manufacturers. The intent is to provide assistance to the small businessman, beginning at the point where other technology dissemination programs end. By cooperating and maintaining close contact with institutions participating in the State Technical Services Program and NASA's dissemination efforts, SBA will be able to assist those small businesses interested in active pursuit of the commercial development of a new idea, but stymied by managerial or financial problems. Such situations will also emerge from SBA's own dissemination efforts.

Responsibility for performing the tasks outlined herein will rest upon the entire staff of SBA, since use of the full range of services is an important part of the program. The principal part of the burden, however, will belong to the technology utilization officers (TUO), located regionally. Plans call for 16 TUOs in the SBA organization by the end of FY 1969. TUOs will generally be responsible for:

- Dissemination, when appropriate. Each TUO maintains contact with representatives of DOD, NASA, and AEC in his area, and with organizations affiliated with the State Technical Services Program. He makes appropriate distribution of information from those sources, supplemental to the SBA publications.

- Recruitment of SCORE people with a technical bent. The TUO maintains a thorough knowledge of the SCORE personnel in his area, which permits deployment of the proper SCORE talent to aid in overcoming problems associated with the application of new technological developments. At the same time he will also establish and maintain contact with organizations which are likely to have

technically oriented, potential SCORE members; and he will actively seek to recruit such prospects.

- Working with and being the focal point of a network of SBA personnel in every state of his area. The purpose of the network is to interface comprehensively with other agencies and to enable SBA to assist in the technology utilization process when needed, whether the need be technical, managerial, or financial in nature.

SBA intends to make its contribution by applying the full range of its services to ensure that a small firm has every chance of locating and using government-controlled technical information. Although it is too early to measure success, this experimental program, dedicated to strengthening the technological posture of small business, offers great potential for extensive business development of previously unexploited technology. This growth will benefit the economy through increased and updated production, the public by availability of new and improved consumer goods, and the defense industry by making possible the competitive production of the most advanced equipment.

Navy Wins Approval for New OMEGA Stations

The Secretary of Defense has approved four more Navy OMEGA Navigation System stations and the purchase of ship and aircraft receiving equipment.

The eight-station OMEGA system will go on the air in late 1972. It will provide world-wide navigational signals from Very Low Frequency (VLF) shore-based transmitters.

Four OMEGA transmitter stations are now in operation serving civilian and military ships and aircraft. The four new stations will be located in the Western Pacific, Tasmanian Sea, Indian Ocean, and southern South America.

The Navy is negotiating for permission to build and operate the stations at foreign sites. Foreign participation in the program is appropriate since OMEGA will be useful to all navigators, both military and civilian. Therefore, foreign partners are being sought to join the United States in completing the OMEGA system.

Defense Industry Employees Cited for Cost Reduction Efforts

Thirty aerospace industry employees were honored for cost reduction efforts at the Fourth Annual Air Force/Industry Cost Reduction Awards Ceremony and Workshop held October 3 in Los Angeles, Calif. The awards, which are given annually, recognize contractor employees who have submitted the most representative cost reduction savings suggestions during the preceding fiscal year.

A total of 126 industry representatives have now been cited by the Air Force for their cost reduction achievements since the awards program was started in 1965.

Award winners this year, representing 20 defense contractors, are:

Aerojet-General Corp.
Sacramento, Calif.

- Jennings Braun
- Milton S. Lev
- Jose C. Vasquez

Air Research Manufacturing Co.
Phoenix, Ariz.

- David Schwerdt

American Chain & Cable Co., Inc.
York, Pa.

- Gerald Ensminger
- Henri Gunsch

ARO, Inc.

Arnold AFS, Tenn.

- Elmer L. Duckett
- Edward E. Erickson
- Floyd G. Moore Jr.

The Boeing Co.
Vandenberg AFB, Calif.

- Richard E. Roller

Dallas Airmotive, Inc.
Dallas, Tex.

- Jack Morris

General Dynamics Corp.
San Diego, Calif.

- Raymond J. Schulte

General Electric Co.
Valley Forge, Pa.

- Louis A. Clairmont
- Paul P. McGavin

Kenway Engineering, Inc.
Bountiful, Utah

- Kenneth A. Richins

Lockheed Missile & Space Co.
Sunnyvale, Calif.

- Jack L. Bellamy

Loral Electronic Systems
Bronx, N. Y.

- Marvin Blinder
- Allen Chertoff

Martin Marietta Corp.
Denver, Colo.

- John R. Anderies

McDonnell-Douglas Corp.
St. Louis, Mo.

- Harry J. Scheffler

McDonnell-Douglas Corp.
Tulsa, Okla.

- Amos Kelley

Melpar, Inc.
Falls Church, Va.

- Mrs. Frieda K. Bernhard

Pan American World Airways
Patrick AFB, Fla.

- Talmage G. Bennett

TRW, Inc.
Redondo Beach, Calif.

- Mrs. Soo Chen Yao

United Aircraft Corp.
Sunnyvale, Calif.

- George Kloves
- John M. Lynch
- John H. Pfeiffer
- George W. Marringer

Vitro Corporation of America
Eglin AFB, Fla.

- Austrial E. Gomillion

Williamson Body & Equipment Co.
Salt Lake City, Utah

- David S. Ostler

Today, 87 parent companies, with 211 plants and divisions, are active in the Defense/Contractor Cost Reduction Program. All defense contractors are encouraged to participate in the program and invited to report their savings to DOD on a semiannual basis. Information and detailed guidance for such participation are available in the Defense Contractor Cost Reduction Program Handbook (DOD 7720.12-H).

System Engineering Facility Established by Defense Communications Agency

The Defense Communications Agency (DCA) has established a System Engineering Facility as a field activity under the command of the Director of DCA. The new organization will perform system engineering for the overall Defense Communications System, and provide strategic communications engineering support, guidance and assistance to DCA and the Military Departments.

An initial complement of about 40 persons, which will staff the activity, will be located temporarily at the headquarters of DCA in Arlington, Va., pending decision on a permanent site in the metropolitan Washington, D.C., area. Captain William T. Peale, USN, has been designated Chief of the System Engineering Facility.

The DCA System Engineering Facility will provide a complete facility for overall system engineering of the Defense Communications System, and the physical equipment and instrumentation for test and evaluation necessary to ensure achievement of the system engineering objectives. This will encompass the automatic switched networks, the transmission subsystem and the operational direction facilities, and the evolutionary development of the Defense Communications System into a single integrated system.

To accomplish its mission, the System Engineering Facility will provide a test bed for systems engineering, system planning support and testing of telecommunication projects, and for the development and validation of computer programs for control and operation of the Defense Communications System of the future. To enhance the interrelationship between system and subsystem engineering, the facility and the Defense Communications Engineering Office will be collocated.

At the facility, switches of the Automatic Voice Network and the Automatic Digital Network will be tied into the Defense Communications System for test purposes only, as will Automatic Secure Voice Communications and the Defense Special Security Communications System in the future.



FROM THE SPEAKERS ROSTRUM

Managing Research and Development Programs

Address by Dr. John S. Foster Jr., Dir., Defense Research and Engineering, at EASCON '68 Convention and Exposition of the Institute of Electrical and Electronics Engineers, Washington, D. C., Sept. 9, 1968.

I have selected three aspects of the ways in which we in Defense Research and Engineering try to make sure that we are utilizing wisely the resources which are brought to bear on national security. The first is a management tool, called the Development Concept Paper, which we use to support the decision whether to go after a major new weapon system. The second addresses the question of how we make sure that the methods of managing and contracting for the development of major new systems are wisely and appropriately selected. The third deals with techniques to help us give clear direction to the thousands of projects which make up our investment in the technological base.

One of the most critical problems we face is making the decision to initiate, or to delay the development of a major new weapon system. Hundreds of millions of dollars of development are involved in a major system, and billions of dollars in its procurement and operation. The security of the United States is at stake. The decision rests on the answers to questions that are complex. These questions involve the character and timing of present and possible military threats with which we may have to cope. Such threats are developed in secrecy and often revealed to us only at late stages. The questions involve the extent to which we believe these future threats can be countered by our present weapon systems, and how

effective the proposed new systems might be.

They involve the difficult projection of confidence in technologies proposed for the future systems.

There are also questions of timing. Should we move now, or wait a year or two for a still newer generation of equipment? The cost of premature commitment to an advanced system can lead to wasteful changes of direction; but undue delay can later necessitate an equally wasteful crash effort to develop a system in time to meet an urgent requirement.

Granted, such decisions are difficult. But what is really important is that the decisions be right.

These decisions must often be made in an atmosphere of controversy with partisans for various options separately pleading their cases, citing their own sets of facts, assumptions and analyses. The Secretary of Defense and his principal advisors will not have the opportunity to read the tens of thousands of pages produced on each of the major issues presented for decision. Nor do these pages often clearly identify the issues or alternatives that are involved. Those in support of each position have usually assembled enough evidence and analysis to make a very effective case for their side, but frequently using different assumptions and ground rules.

We all have a tendency to describe a system in such technical terms, from so many disciplines, that its real significance to our security is not made clear. Sometimes enthusiasm to get on with an exciting technical innovation substitutes for justification that the effort is in the best interest of national security.

Recognizing the tendency for these kinds of things to develop, we ask



Hon. John S. Foster Jr.

what can we give the decision maker to enhance his opportunity to make the correct decision? How do we come to grips with the issues on which the decision must turn?

Now, what the decision maker would really like to have is just one paper; short enough so that he can study it carefully; comprehensive enough to present the issues, facts and analysis which are truly relevant, and material, to his decision; comprehensible so he can easily understand it; and impartial, in that it includes the best case which can be made for the system and the best case which can be made against it, all on the same base.

Development Concept Papers

During the past year, we have devoted a major effort to generating just such papers which we call Development Concept Papers (DCPs). As you can well imagine, their formulation can be exceedingly difficult. It is not enough to have a long list of pros, and a long list of cons. We must isolate out the crucial issues on which the decision must depend, and weave those together in a coherent and illuminating form.

A most important innovation of this document is that it is signed by the Secretary, or Assistant Secretary

for Research and Development, of each Military Department involved, and by the Chairman of the Joint Chiefs of Staff or the Assistant Secretaries of Defense when their functions are involved. These signatures mean that, from the point of view of their offices, the paper contains the very best arguments to support their positions. The signatures also mean that they agree that the arguments presented on the other sides are substantive and relevant.

We have maintained the discipline that all substantive arguments must be stated in the DCP within 20 pages, and that no signer may require an appendix to present his special pleading.

It is not only our perception of a proposed system and its significance which is hammered out on this anvil. The mission and concept of the proposed system itself are also often changed. The process serves to set aside any peripheral considerations which had preoccupied earlier debates, and bring into focus more current and central issues.

Clearly this practice is new to us and somewhat experimental. While we are very excited, the true test of its worth must come with time and experience.

Examples of DCP Process

Let me discuss two examples.

One DCP deals with the next generation of our military communications satellite system. A year ago, when we attempted the preparation of a concept paper on this system, the idea of a satellite system for military communications seemed attractive. A development program had been initiated five years earlier and there was widespread support from both users and communicators. However, as we developed the rationale, we realized that the role for which the system had been intended clearly could not justify the costs. The system had seemed most important for communications between headquarters in all-out nuclear war, but this could now probably be better done with other systems. However, on analysis, the satellite system looked more attractive for command communication into and within very important areas of crisis or limited conflict. The DCP process then led us to consider the potential value of the much higher gain satellite antenna

systems which were "around the corner." These offered much lower net communications costs and much more easily transportable terminals, enhancing the adaptability of the system to the rapid establishment of military communications into areas of crisis. This led to a decision to proceed with a system which will be operational a year or two later than the system we considered when we started the DCP process. It will cost a third or so more but will have 5 to 10 times the capacity, and will supply some key capabilities for both strategic and tactical communications in contingencies and limited wars.

Thus the concept, principle uses, technology, schedule and costs of the proposed system all underwent major changes due to the DCP process. The end result is that we are adding a very important and versatile system to our inventory.

Another example is the VSX aircraft which we are developing to conduct anti-submarine warfare from aircraft carriers. When this concept paper was started, it was thought that the principal issues would be the characteristics and schedule of the aircraft. There were heated debates about these issues initially, but they were soon settled. A much more basic issue which came into focus under this process was whether we needed to rely at all on carrier-based aircraft for anti-submarine warfare, or whether it was wiser to rely only on land-based aircraft. Analyzing this with the Navy, it became apparent that the answer was a function of the vulnerability of carriers, the availability and distribution of shore bases and their distances from the areas of importance for anti-submarine warfare. The DCP which resulted analyzes these issues. The decision to develop the VSX aircraft then followed rather easily.

We have so far submitted 14 such papers and each has led to a firm decision. About 80 are currently in process.

I must add that one of the most comforting feelings which a technical manager can have is to realize that the strongest possible case against his program has been made, and examined at the highest levels, and that the result was the decision to go for the next major step.

Let me summarize. The use of a Development Concept Paper injects several important disciplines. It pro-

vides the rationale which led to the decision. It includes the best supporting case and the best opposing case. It requires the concurrence of all responsible parties to its facts and arguments. It serves to communicate the decision and its rationale to the Services. It specifies the threshold for changes in threat, cost, performance and schedule which must lead to a review of the decision. Therefore, it serves to delegate authority to proceed with development within these limits.

The issues treated in these DCPs are of very serious importance to our security. It is crucial that the assumptions and rationale involved be subjected to the most careful and competent scrutiny. For this reason, I am undertaking to make some of them available, once certain private matters have been deleted, to selected organizations outside the Defense Department. I will be soliciting their earnest and frank appraisal and suggestions.

Managing the System Development Process

Let me now turn to my second topic—the management of the system development process. In 1964, we introduced two new procedures designed to help make sure that development of major systems was an orderly and efficient one, under firm management control. These procedures are called concept formulation and contract definition. Allow me to take a moment to recall for you what is to be accomplished in each of these procedures. The purpose of the concept formulation phase is to make sure that adequate requirements analysis, experimental work, and design studies are done to give us high assurance that major uncertainties have been eliminated prior to the start of full scale development. Thus, concept formulation must show four things:

- That mission and performance envelopes have been defined and the cost effectiveness of the proposed system has been shown to be more favorable than that for any other competing system.

- That a thorough trade-off analysis has selected the best technical approach.

- That the remaining work to be done is primarily of an engineering rather than an experimental character.

- That the cost and schedule estimates are credible and acceptable.

Let me repeat, the purpose is to make sure all of these things are clearly demonstrated, before we are willing to commit DOD to the development and deployment of a major weapon system. Clearly the completion of concept formulation may require a great deal of exploratory and advance development of technologies and designs. During this process, a number of systems concepts may be rejected, shelved, or modified.

After concept formulation has been completed, if we decide to proceed with further development, we initiate the second procedure called contract definition. This process normally involves competitive contractors who must produce firm management and contract plans, firm and realistic schedules and cost estimates for development. The competing contractors must also verify technical approaches and identify risk areas. Only with these results in hand will we confirm the decision to proceed with large scale engineering development of a major weapon system.

Four years have passed since these approaches were introduced, and I believe it is not too early to take stock and to ask whether still further changes in theory or practice might be required. In my experience, the introduction of concept formulation and contract definition has, in many cases, led to a great deal more care and thought being given to formulating the purpose, concept and functioning of proposed systems. It has led to an emphasis on the development of advanced technologies and techniques before commitment to a systems development program. The result has often been a greatly increased confidence that we can, in fact, acquire a weapon system with efficient use of our development resources.

On the other hand, their use has sometimes led to over-confidence that engineering developments will be straightforward and free of surprises, and hence to pressure for tough fixed-price contracts. There are also strong pressures to enter contract definition before the four conditions of concept formulation are fully met, in order to establish a driving commitment to procure. If these procedures lead DOD and its contractors to underemphasis or gloss over the tough problems or risks

which remain in the development of a system, the result can be to reduce the incentive to pursue needed technical advances. Such pressures could also strain the technical integrity of the participants. In either case, such practices would defeat the purposes which led to the introduction of these management concepts.

There are programs with clear requirements and solutions, and little technical risk, where formal concept formulation and contract definition may introduce costs and delays that are not justified. There are programs where the research and development costs are such a small fraction of the total procurement costs or the total costs of ownership, that the choice between alternative technologies or designs should depend on a competition in system hardware rather than in paper. There are cases, even for major weapon systems, where engineering development risks should be accepted and flexibly shared by the Government and the contractor.

So far, it seems to me, the contracting flexibility exists. It is the tendency to force a Procrustean approach on our contracting procedures that needs our attention. We must be prepared to experiment and innovate with these tools. I believe that here, too, our approach must be to require an explicit formulation of the choice of program management and the rationale for that choice. Accordingly, I have initiated the practice that any DCP which analyzes development of a major weapon system will also analyze the appropriateness of contract definition or of competition in hardware, or of other forms of program management. I have also directed that where contract definition is required, the Development Plan produced must discuss the appropriate contract conditions for development in the light of these risks and uncertainties. I firmly believe these steps will facilitate the exercise of prudent judgment in the application of management and contracting tools.

Now to my third subject—the strategy for managing the thousands of smaller programs. We spend almost \$2.5 billion annually on projects covering every engineering specialty and most scientific disciplines. They represent over 10 percent of the nation's investment in research and development. We cannot manage these individual projects from the Office of the Secretary of Defense,

nor should we even try. We must treat aggregates of projects. We must support disciplines which give promise of major innovations of possible defense significance. We must support efforts to seek and develop new techniques, especially where our systems are deficient or where new technologies can permit the concept of new systems. The problem of setting priorities is simply that it requires the assessment of so many activities and needs.

Yet we must assure ourselves that the overall investment is wise—effective and adequate. No one management technique or approach will give us this assurance.

Investment in Technology Base

One approach, which we use, is to carry out a continual topical sampling in depth. When we face a decision on the possibility and timing of a major new system, we probe hard and deeply into the technological programs on which it would depend, and into projects which might offer alternatives and further advances. These projects achieve a high visibility for awhile, and are often subject to redirection and emphasis. Those that seem to be on the critical path to the success of the proposed new system may be kept in the spotlight for a long time.

When we were wrestling with the decision on the next generation defense satellite communication system, for example, we explored carefully the state of the art in the technologies which contribute to communications satellites. This led to the decision to delay the system so that we could go for the high-gain, narrow-beam antennas on a stabilized platform. It also led to a number of confirmations and modifications to projects from which a still later generation system can emerge, such as phased array antennas, electrostatic propulsion systems, nuclear batteries and solid state microwave components.

But this topical sampling is really not enough. As I stressed earlier, managing defense research and engineering demands the discipline of fully explicit reasoning and judgments. Without an explicit and complete strategy, we do not know whether we have really thought through the situation, and we cannot expose our full strategy to the constructive criticism of others. We cannot com-

municate our reasoning effectively to those who must be guided by it.

So we must do more. In fact, we are now experimenting with two new approaches. One is the subject of a current Air Force experiment. This approach attempts to set the levels of effort in exploratory development by relating clusters of projects to alternative possible systems and long-term operational objectives. It is a serious attempt to provide reference material for research and development management. We intend to evaluate carefully the results of this experiment because we recognize the problems and possible risks in compiling and relating individual judgments about relatively long-range efforts.

Another new management approach, with which we are experimenting, is a series of Technical Area Plans. Each plan examines the parts of the total research and development program which support our capability in a technical area such as electronic warfare, jet engines, or reconnaissance. It will examine the present and evolving role which that area is playing in national security, and the role it might play if promises were realized. It will identify the critical inadequacies in our present systems, and the most significant needs of new systems. It will identify the important technological alternatives, their status, their risks, and the probable time and effort required to establish their feasibility and utility. It will identify the major studies, experiments and prototypes needed to assess these technologies. It will trace the demands on the underlying scientific and engineering disciplines, and sort out the new opportunities emerging from those disciplines. Finally, it will specify the goals, priorities, timings and inter-relationships with which these various efforts will be pursued.

The rationale for experimenting with these approaches is that we must be persuaded that our resources are wisely and effectively invested. We must be persuaded that important opportunities and needs have been identified with proper priority, and that sufficient efforts are underway. Where both urgent need and high risk are involved, there must be a diligent search for realistic alternatives. We must be confident that our efforts are rationally distributed between the needs for immediate

pay-off and for longer range advances.

These approaches are difficult to pursue because they depend upon probabilities and uncertainties. But such Technical Plans are not intended to be exhaustive, to trace all of the technical roots of every potential advance, nor could they be. They are intended, rather, to highlight the technologies on which our future capabilities now seem to depend most critically and those which offer major advances, so that we can be sure adequate priority is directed to their pursuit and exploitation. Thus, these plans serve to make explicit and visible our program priorities, and the rationale behind those priorities. The attempt to view our programs in this way has already rewarded us by bringing opportunities and inefficiencies into focus. It has led to very important changes in our programs.

In electronic warfare, it has led us to supplement our fruitful Quick Reaction Program with greater emphasis on more orderly advanced and engineering development of multi-mode equipment, and on technology for countering new classes of threats. It has led us to stress technology for the integration of extant electronic warfare equipment aboard ship, into the whole command and control network of ship defense, even at the expense of some new equipments.

In navigation, it has led us to realize that highly stable inertial navigators, which have been under development for weapon delivery, can potentially be operated with proposed satellite navigation systems, so as to extend their applicability and greatly reduce their cost.

In battlefield surveillance, it has led us to a much greater emphasis on newer sensor technologies.

Even in basic research fields we have applied this kind of explicit review of on-going programs and goals. For example, we decided about two years ago to phase out our support of high energy physics research. This decision was based upon a careful assessment of the relevance and potential to national security of this work, compared with our other basic research needs, and upon the clear national responsibilities of the Atomic Energy Commission and the National Science Foundation for this area.

I wish to challenge you to make

explicit the rationale behind the Technical Area Plans within your laboratories or corporations. You are investing your talents and resources in certain ways, because you perceive a path from your work to something of importance to our society. You should not accept the rationalization sometimes presented to industrial management that a research and development project is supported by DOD and, therefore, must be relevant and important. You must be satisfied that programs which you manage, whether supported by DOD or from other sources, make excellent sense. Let us exchange our best explicit judgment regarding technical opportunities and priorities. I intend to present our technical area strategies for criticism by selected groups of individuals and contractors. I hope you will reciprocate. It is crucial to develop our collective best reasoning.

Let me make clear that many approaches to research and development management must be used together. No one technique should be exclusive. A new management tool, no matter how exciting in theory, must mature through use in conjunction with other methods.

I suspect you have recognized two of my fundamental convictions on management. One is that wise decisions are greatly aided by the discipline of writing down, explicitly and succinctly, the rationale for decision. The other is that decisions on defense research and development must be closely criticized by all who care about national security.

Army To Close 23 Nike Hercules Sites

Twenty-three Nike Hercules firing sites and seven headquarters installations have been scheduled for closure by the U.S. Army.

The firing sites and installations are being shut down to help reduce expenditures for FY 1969 as required by the Revenue and Expenditure Control Act of 1968.

It is expected that \$18.8 million will be saved by these closings in FY 1969, and \$54 million in each succeeding year as a result.

Although it was originally planned to close some of the sites by the summer of 1970, the closing was speeded to help meet DOD's share of the limitations imposed by the Revenue and Expenditure Control Act.

Technical Objective Document Program

Aerospace power, one of the vital elements of national security, depends on a vigorous and continuous application of the most up-to-date technology.

The continued advancement in technology required to maintain aerospace leadership is the result of a maximum degree of teamwork between the Air Force and the scientific and industrial community. Such teamwork is possible only if adequate means are provided for defining technical problems, and exchanging research and development information basic to their solution.

To implement this team effort and promote its success, the Air Force releases to qualified scientific and industrial organizations documents known as Technical Objectives to be attained for future operational capabilities desired by the Air Force. It is through the combined efforts of the Air Force and the scientific and industrial community that the greatest progress can be made.

Air Force Technical Objectives are statements of efforts needed to satisfy an existing or anticipated need. They are prepared and compiled into Technical Objective Documents (TODs) by the Air Force laboratories of the Air Force Systems Command (AFSC) and the Office of Aerospace Research (OAR). These TODs are published and distributed by the Office of the Director of Laboratories (AFSC), and are made available to qualified organizations upon recommendation of AFSC Scientific and Technical Liaison Offices (STLOs) and subsequent approval of the Technical Objective Documents Board.

Technical Objectives range from general to specific in nature and contain information as to the state of the art and future possibilities. They also identify the Air Force laboratory personnel who may be contacted for more detailed information.

Establishment of Technical Objectives

Based upon our national military objectives, Headquarters, U.S. Air Force, provides broad program guidance for the entire Air Force. Using this guidance, Headquarters, Air Force Systems Command, describes systems concepts and high potential areas of research and development where progress is required to maintain aerospace superiority. In response to this guidance, plus inputs from other sources, the Air Force laboratories derive a set of technical goals. Each goal has been formalized under the title, "Technical Objective." These are then grouped by technical area into Technical Objective Documents, which form part of the overall plan to obtain the desired future Air Force operational capabilities.

The Purpose of TODs

The purpose of the TODs is to stimulate participation by scientific and industrial organizations in Air Force research and development programs by providing them with specific technical objectives toward which they can direct their research efforts.

TODs serve as a means of communication between the Air Force and American industry by providing the following services:

- Assistance in research and development planning.
- Broad technical guidance not normally available.
- Help in formulating relevant technical proposals.
- Assistance in recognizing internal programs which apply to Air Force needs.
- Aid in working with other government agencies.
- Aid to subcontractors in working with prime contractors.

- Identification of Air Force laboratory technical personnel having responsibility in specific technical areas.

Eligibility for the TOD Program

Eligible organizations include only those which have a sustained capability and a willingness to perform research and development as outlined in the TODs. In each case only those documents which cover technical areas in which the organization has a research and development capability will be released.

TODs are not authorized for release to the following categories:

- Professional societies, however, member organizations may apply individually for consideration.
- Organizations that are in the process of forming a business pool. Consideration will be given when the pool has been approved by the Small Business Administration.
- Organizations which are in financial difficulty or which have a poor reputation for business integrity.
- Organizations whose capabilities are based primarily upon those of consultants or part-time employees.

Each organization that desires TODs must establish a technical representative as a single point of contact to handle the documents. This point of contact is responsible for determining the overall needs of the organization and for obtaining and distributing the documents, as well as apprising all key executives, scientific and technical personnel in his organization of the Air Force TOD Program.

Area AFSC Scientific and Technical Liaison Offices (listed in Figure 1) are responsible for the conducting research and development capability surveys of organizations requesting TODs. Their findings and recom-

mentations are used as guidelines in approving or disapproving an organization's eligibility for receiving TODs

Ultimate authority for approving all requests to participate in the TOD Program is vested in the Office of the Director of Laboratories (AFSC). The Laboratory Plans Office (SCTPL), Directorate of Laboratory Plans and Programs, Director of Laboratories, Headquarters, Air Force Systems Command, is responsible for the overall coordination and monitoring of the TOD Program, and also for establishing policies and procedures for releasing TODs.

Procedures for Requesting TODs

The first step in requesting participation in the Air Force TOD Program is to write to Headquarters, Air Force Systems Command (SCTPL), Andrews AFB, Washington, D. C. 20331, and determine if your organization is already participating. If the answer is yes, AFSC will provide the name of the individual who has been designated as the TOD contact point. If your organization is not participating, the necessary forms and instructions for initiating participation will be provided.

Security Requirements

Because some TODs are classified, appropriate clearance for receiving and storing security documents is required. When justified, however, an organization not having a security clearance or one of high enough level may be recommended for a security clearance or for upgrading of a current clearance in order to receive classified TODs. Such security clearances are initiated at Headquarters, Air Force Systems Command (SCTPL), subsequent to approval of an organization to receive classified TODs. Therefore, regardless of current security status, an organization should not hesitate to request all TODs considered applicable to its current research and development capability.

Distribution and Use of TODs

Automatic distribution of new TODs is not authorized. Prior to distribution of the new documents Headquarters, Air Force Systems Command, will request that all TOD recipients of the latest superseded documents verify their desire to receive

Air Force Systems Command Scientific and Technical Liaison Offices (AFSC STLOs)

Area Office and Geographical Area of Responsibility

AFSC STLO (SCTL-1) 424 Trapelo Road Waltham Federal Center Waltham, Mass. 02154 Phone: (617) 894-2400 Ext. 331 or 332	Maine, New Hampshire, Vermont, Massachusetts and Rhode Island
AFSC STLO (SCTL-2) Room 222, O'Hare Office Center 3166 Des Plaines Ave. Des Plaines, Ill. 60018 Phone: (312) 299-1089	North Dakota, South Dakota, Nebraska, Minnesota, Iowa Wisconsin, Illinois, Indiana and Missouri
AFSC STLO (SCTL-3) Room 227, Federal Office Bldg. 1240 E. 9th St. Cleveland, Ohio 44199 Phone: (216) 522-5010 or 5011	Michigan, Ohio, Kentucky and Tennessee
AFSC STLO (SCTL-4) 500 S. Ervay St. Dallas, Tex. 75201 Phone: (214) 749-2025 or 2026	Mississippi, Kansas, Arkansas, Louisiana, Oklahoma, Texas and New Mexico
AFSC STLO (SCTL-5) 26 Federal Plaza New York, N. Y. 10007 Phone: (212) 261-0370 or 0371	New York, New Jersey, Connecticut and Pennsylvania
AFSC STLO (SCTL-6) Suite 104 363 S. Taaffe Ave. Sunnyvale, Calif. 94086 Phone: (408) 245-9535 or 9536	Colorado, Wyoming, Utah, Nevada, Hawaii and that part of California north of the 36th parallel (approximately through Bakersfield)
AFSC STLO (SCTL-7) The Boeing Co. Seattle, Wash. 98124 Phone: (206) 655-5744	Alaska, Montana, Idaho, Washington and Oregon
AFSC STLO (SCTL-9) Department of the Navy Munitions Bldg. Washington, D. C. 20360 Phone: (202) 696-3594 or 5568	Delaware, Maryland, Virginia, District of Columbia, West Virginia, North Carolina, South Carolina, Georgia, Florida and Alabama
AFSC STLO (SCTL-10) Air Force Unit Post Office Los Angeles, Calif. 90045 Phone: (213) 643-1621 or 1698	Arizona and that part of California south of the 36th parallel

Figure 1.

the new TODs. Should additional TODs be desired, other than those previously authorized, information regarding research and development in the additional areas must be furnished.

Old documents need not be returned before receiving new ones. When they have served their purpose, TODs are to be destroyed in accordance with paragraph 19 of the Industrial Security Manual for Safeguarding Classified Information. Duplicate certificates of destruction are not desired by Air Force Systems Command.

TODs will not be reproduced or disseminated outside the receiving organization without written permission of Headquarters, Air Force Systems Command.

Organizations which determine from a TOD that they can contribute to the achievement of a specific technical goal are invited to discuss the objective further with the scientist or engineer identified with that objective. New ideas not included in the TOD, which can make a significant contribution to military technology, are welcomed and encouraged.

TODs should not be considered the sole indication of Air Force technical interest. They should not confine but should stimulate thinking. Ideas and proposals for technical development, whether in reference to a TOD or not, are most welcome. These ideas may be submitted as unsolicited proposals in accordance with instructions outlined in the November 1968 issue of the *Defense Industry Bulletin*, page 24.

Following is a list of current Air Force TODs giving the document number, security classification, title and the responsible organization:

TOD 70-1 (Secret)
Advanced Weapons and Applications
Air Force Weapons Laboratory
Kirtland AFB, N. M. 87117

TOD 70-3 (Unclassified)
Aerospace Biotechnology
Aerospace Medical Division
Brooks AFB, Tex. 78235

TOD 70-4 (Unclassified)
Aerospace Vehicle Equipment
Air Force Flight Dynamics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-5 (Secret)
Avionic Communications
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

70-6 (Unclassified)
Bionics, Lasers, and Molecular Electronics
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-7 (Secret)
Chemical—Biological Munitions and Defense
Air Force Armament Test Laboratory
Eglin AFB, Fla. 32542

TOD 70-8 (Secret)
Conventional Munitions
Air Force Armament Test Laboratory
Eglin AFB, Fla. 32542

TOD 70-9 (Unclassified)
Power Generation
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-10 (Unclassified)
Aerospace Ground Support
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-11 (Secret)
Intelligence
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-12 (Unclassified)
Electromagnetic Reliability and Compatibility
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-14 (Secret)
Electromagnetic Transmission and Reception (below 15 GHz)
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-15 (Secret)
Electromagnetic Vehicle Environment, Camouflage, and Antennas
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-16 (Secret)
Electromagnetic Warfare
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-17 (Unclassified)
Flight Control
Air Force Flight Dynamics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-18 (Unclassified)
Flight Mechanics
Air Force Flight Dynamics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-19 (Unclassified)
Fuels, Lubrication, and Hazards
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-20 (Secret)
Ground-Based Surveillance
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-21 (Secret)
Ground Communications
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-22 (Unclassified)
Human Resources
Air Force Human Resources Laboratory
Brooks AFB, Tex. 78235

TOD 70-23 (Unclassified)
Information Displays
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-24 (Unclassified)
Information Processing
Rome Air Development Center
Griffiss AFB, N. Y. 13440

TOD 70-26 (Unclassified)
Materials
Air Force Materials Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-27 (Secret)
Navigation, Guidance, and Weapons Delivery
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-30 (Unclassified)
Electric Propulsion
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-31 (Unclassified)
Electromagnetic Propagation and Plasmas
Air Force Cambridge Research Laboratory
L. G. Hanscom Field, Mass. 01730

TOD 70-33 (Confidential)
Ramjet Propulsion
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-34 (Secret)
Aerospaceborne Reconnaissance and Surveillance
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-35 (Confidential)
Rocket Propulsion
Air Force Rocket Propulsion Laboratory
Edwards AFB, Calif. 93523

TOD 70-36 (Unclassified)
Structures
Air Force Flight Dynamics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-37 (Confidential)
Turbine Engine Propulsion
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-38 (Unclassified)
Vehicle Dynamics
Air Force Flight Dynamics Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-39 (Unclassified)
Terrestrial Environment
Air Force Cambridge Research Laboratory
L. G. Hanscom Field, Mass. 01730

TOD 70-40 (Unclassified)
Atmospheric Environment
Air Force Cambridge Research Laboratory
L. G. Hanscom Field, Mass. 01730

TOD 70-41 (Unclassified)
Space Environment
Air Force Cambridge Research Laboratory
L. G. Hanscom Field, Mass. 01730

TOD 70-42 (Secret)
Space Site Support
Air Force Aero-Propulsion Laboratory
Wright-Patterson AFB, Ohio 45433

TOD 70-43 (Unclassified)
Technical Facilities
Arnold Engineering Development Center
Arnold AFS, Tenn. 37389

Technical Performance

(Continued from page 3)

ard, other related technical management efforts going on in DOD which ODDR&E is trying to integrate are those on bid work statements, on the internal guidance to system engineering management needed to supplement the contract standard, and on system effectiveness analysis guides. The new DOD work breakdown structure and configuration management directives are also parts of this integration effort. All of these separate "building blocks" of a technical program management system must hang together. By acting as the focal point for all such efforts in the Office of the Secretary of Defense, ODDR&E is trying to help to assure that these efforts are, in fact, developed in a proper relationship to each other. ODDR&E feels that a set of agreed upon goals for the overall effort, a plan for satisfying these goals, and a scheduled application of the mix of resources (possibly industrial as well as DOD) are needed to implement this plan. It is of significance to note that, in recognition of the importance of building a sound foundation in this whole area of project/program technical control, the Director of Defense Research and Engineering has asked that this subject be one of the "Fundamental Problem Areas" for consideration by the Secretary of Defense's Industry Advisory Committee (IAC) in the immediate year ahead.

Summarizing the TPM aspects of the job, most people agree that research and development can be increasingly better planned as the program cycle proceeds. Since this is the case, it should be increasingly possible to validly measure progress against plans. This measurement, in turn, should identify deviations from plans and permit an assessment of what is happening and what needs to be done about it, not only in the technical area but in the cost and schedule areas as well. A mutual goal in this whole effort should be the earliest possible identification of foreseeable problems, together with an analysis of why things are going wrong, all of which is presented in a fashion which can readily be understood by management so that timely corrective action can be taken. As mentioned earlier, many industrial

companies have taken major steps to improve their performance measurement systems and others are encouraged to do likewise. Significant progress can be made in the days ahead if both industry and the Defense Department, individually and collectively, apply themselves to this mutually beneficial task. There is admittedly a danger that, as they focus on measuring things, too much emphasis will come to be given to measuring the measurable, and that this, in turn, will come to make those things which are measurable the important aspects of a program in people's minds. However, if DOD and industry are both ever alert to this danger, the eventual value to be gained from good performance measurement will offset many fold the risk being taken.

Man's Underwater Capability Object of Navy Research

The Navy has launched a research project which promises to give additional knowledge about man's sensory behavior and speech performance in underwater operations.

Included in the project are plans to devise techniques of optimizing performance in sensory surveillance, as well as determining abilities in monitoring visual, auditory and tactical display.

Specific research has been designed to improve methods of using sensory skills not now used, and to select individuals who have special sensory skills for submarine duty.

Man's ability to speak effectively in underwater environment forms the second major area of research. Experiments are planned in speech production and reception in closed environments and undersea habitats.

Verbal communications among divers and swimmers, and the effects of water immersion on verbal behavior are also on tap for study.

The research program is being conducted by the Behavioral Science Division of the Submarine Medical Center, New London, Conn., in association with scientists at the University of Connecticut and Connecticut College.

NATO Establishes Industrial Advisory Group

The North Atlantic Treaty Organization (NATO) will establish an Industrial Advisory Group composed of four representatives from each member country.

Decision to form the advisory group was made during the NATO Conference of National Armament Directors and endorsed by the North Atlantic Council in Brussels, Belgium, on Oct. 14.

Purpose of the group will be to serve in an advisory role to the NATO Conference of National Armament Directors.

The group will also serve as a focal point for review and discussion of special studies and problems of industries which should be brought to NATO's attention.

Other functions of the group will be to improve the flow of information to and from industry in NATO countries; to provide discussion of research, development and production policies and practices as they affect industry; and to provide a forum to present significant problems to a cross-section of NATO industry.

First meeting of the Industrial Advisory Group will be held early in 1969 in Brussels, Belgium.

Each NATO member country will furnish a maximum of four industry representatives to attend each advisory group meeting. In addition, two senior government advisors from each country will attend.

To insure maximum participation, six industrial representatives have been named to serve as U.S. delegates to the Advisory Group meetings. The U.S. representatives were selected by the American Ordnance Association, National Security Industrial Association, Aerospace Industries Association, and Electronics Industry Association.

U.S. representatives are:

Elmer P. Wohl, Vice President, Administration, Aerospace & Systems Group, North American Rockwell Corp., 1700 E. Imperial Highway, El Segundo, Calif. 90246.

Forest W. Crowe, Vice President and General Manager, UNIVAC Federal Systems Div., Sperry Rand

Corp., 2750 West 7th Blvd., St. Paul, Minn. 55116.

Ned B. McLean, Chairman of Edo Corp., 14-04 111 St., College Point, N.Y. 11356.

Willis M. Hawkins, Vice President Science and Engineering, Lockheed Aircraft Corp., 2555 N. Hollywood Way, Burbank, Calif. 91503.

Mansfield D. Sprague, Vice President Corporate Programs, American Machine & Foundry Co., 1701 K St., N.W., Washington, D.C. 20006.

Robert Kirk, Vice President, International Telephone & Telegraph Corp., 320 Park Ave., New York, N.Y. 10022.

Mr. McLean was elected as the first chairman of the U.S. group and Mr. Wohl was elected Vice Chairman. Mr. McLean, Mr. Hawkins and Mr. Kirk will serve for one year. Mr. Wohl, Mr. Sprague and Mr. Crowe have been named to the group for two years.

The U.S. representatives are sponsored by the Defense Department.

ILS Planning Guide Available to Contractors

An "Integrated Logistics Support Planning Guide for DOD Systems and Equipment" has been published by the Office of the Secretary of Defense. The Guide presents a systems engineering approach to the integration of support management with the other project management functions of design and production. It provides Service and contractor project managers with a basis for tailoring their own management planning of specific tasks during the development and acquisition of new weapons and equipment (see article, "Integrated Logistic Support, the Life Cycle Task of Support Management," *Defense Industry Bulletin*, June 1968 page 1).

The Guide is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for \$3.75. Military Service contract managers can obtain copies through their own departments.

Army Tests New Lightweight Bridge

Testing of the first production unit of a lightweight assault bridge that can be emplaced hydraulically in less than two minutes without exposure of personnel has been started by the Army.

The test bridge is the first of 29 production units being built by the Unit Rig and Equipment Co., Tulsa, Okla. Five of the units will be used for research, development and testing while the remaining bridges will be shipped to Vietnam for field evaluation.

Developed by the Army Mobility Equipment Research and Development Center at Fort Belvoir, Va., for use in the rice fields and swamps of Vietnam, the bridge is carried and launched by the M-113 armored personnel carrier.

The span is capable of supporting 15-ton loads over gaps up to 33 feet. Made of weldable aluminum alloy, it weighs 2,700 pounds and can be emplaced where heavier bridge equipment would bog down.

The bridge is carried in a folded position and can be emplaced or retrieved by hydraulic power from either end. Retrieval is performed by reversing the hydraulic connections.

An extruded orthotropic plate deck, rather than the traditional stringer floor beam design, is used in the construction of the bridge. This eliminates structural redundancies found in previous bridges and makes the roadway surface the primary load carrying member.

The cross-sectional configuration of the bridge is in the form of an open box, with two tapered sections hinged together to form one treadway. Two treadways are joined by bolted cross braces to form the roadway.

A double centered non-eccentric hinger, at the folding point of the two leaves of the bridge, provides a completely flush bottom flange when the bridge is in the open position. The folding mechanism includes a lightweight hydraulic cylinder with major aluminum components. The launching mechanism is a three-link mechanism, also constructed of an aluminum alloy, and pin-connected to the vehicle at six points.



RESEARCH REPORTS

Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche copies (65¢) or full-size copies (\$3) of the documents (unless otherwise indicated) from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Interior Coating Systems for Surfaces in Contact with Petroleum Fuels. Office of the Director of Defense Research & Engineering, Washington, D.C., March 1968, 54 p. Order No. AD-666 969.

Oxirane-Polyester Re-in System in Air Drying Gloss Enamels. Army Coating & Chemical Laboratory, Aberdeen Proving Ground, Md., April 1968, 135 p. Order No. AD-668 647.

Polyurethane Coatings for Rain Erosion Protection. Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, March 1968, 31 p. Order No. AD-669 058.

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Reliability and Confidence Limits for Sample Testing. Naval Missile Center, Point Mugu, Calif., April 1968, 207 p. Order No. AD-668 984.

The Application of the Concept of Reliability to Textile Products. Army Natick Laboratories, Natick, Mass., Sept. 1967, 30 p. Order No. AD-668 907.

Propellant Specifications Preparation and Use. Air Force Rocket Propulsion Laboratory, Edwards AFB, Calif., Oct. 1967, 50 p. Order No. AD-664 871.

A Critical Review of Analytical Methods for Estimating Control Forces Produced by Secondary Injection—the Two Dimensional Problem. Naval Ordnance Laboratory, White Oak, Md. Jan. 1968, 98 p. Order No. AD-669 445.

Invariant Properties of Composite Materials. Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, March 1968, 33 p. Order No. AD-668 761.

Analysis of the Flexure Test of Bidirectional Composites. Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, March 1968, 17 p. Order No. AD-669 056.

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Properties and Applications of Dispersion-Strengthened Metals. Army Materials Research Agency, Watertown, Mass., June 1967, 23 p. Order No. AD-669 615.

Proceedings of Symposium of TiNi and Associated Compounds. Naval Ordnance Laboratory, White Oak, Md., Feb. 1968, 230 p. Order No. AD-668 696.

Remote Sensing in Oceanography. Naval Oceanographic Office, Washington, D.C., March 1968, 41 p. Order No. AD-670 002.

Oceanographic Thermal Gradient Display Study. Futronics Corp., Port Washington, N.Y., for the Navy, Sept. 1965, 77 p. Order No. AD-669 488.

A Review of the State-of-the-Art of Fluidic Control. Naval Ship Engineering Center, Philadelphia, Pa., March 1968, 19 p. Order No. AD-667 597.

Surface Moorings, Review of Performance. Woods Hole Oceanographic Institution, for the Navy, March 1968, 68 p. Order No. AD-668 217.

Underwater Work Measurement Techniques: Initial Studies. Univer-

sity of California at Los Angeles, for the Navy, March 1968, 105 p. Order No. AD-668 180.

A Parametric Study of High Speed Support Amphibians. Hydronautics, Inc., Laurel, Md., for the Navy, Feb. 1968, 228 p. Order No. AD-667 251.

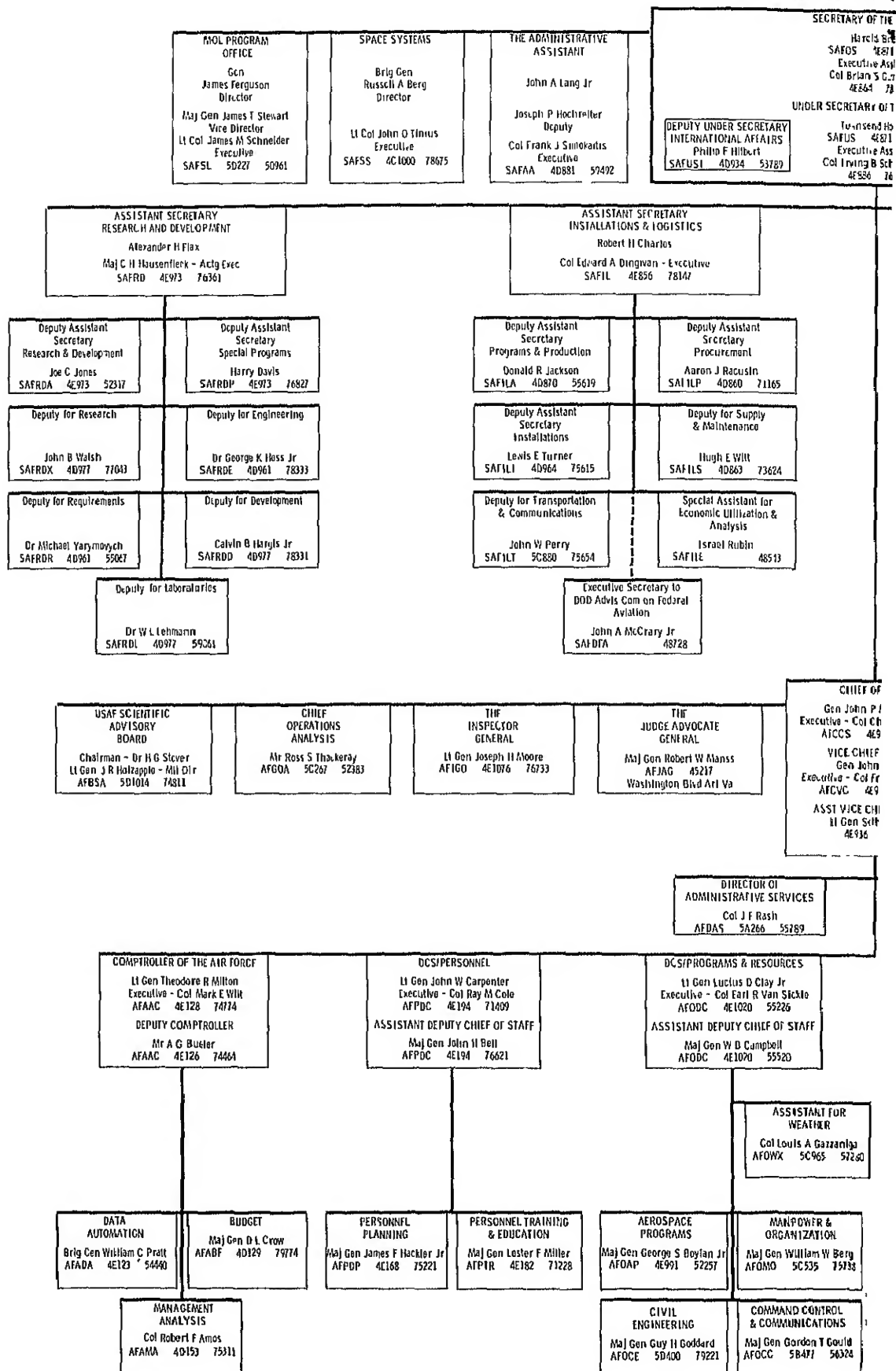
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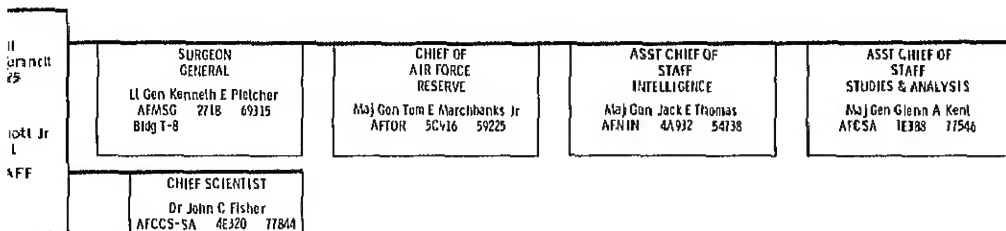
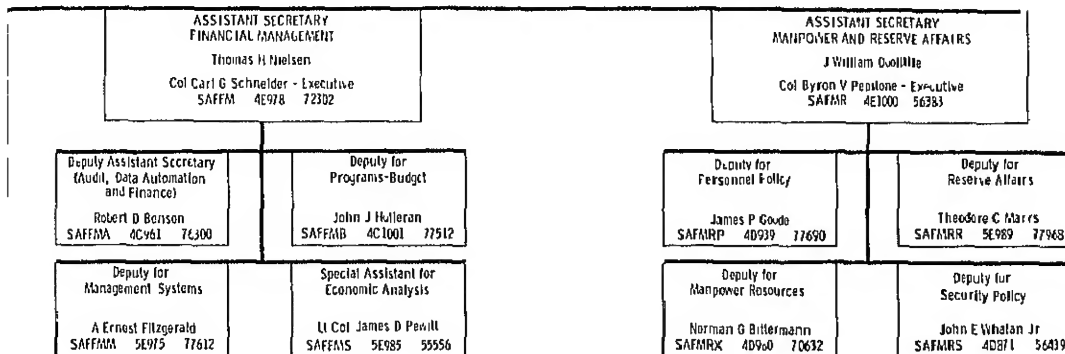
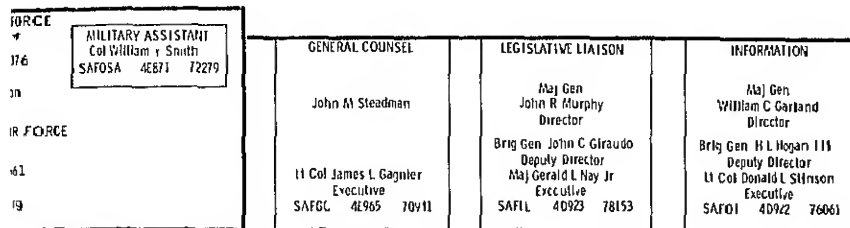
DEFENSE PROCUREMENT CIRCULARS

Distribution of Defense Procurement Circulars is made automatically by the U.S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

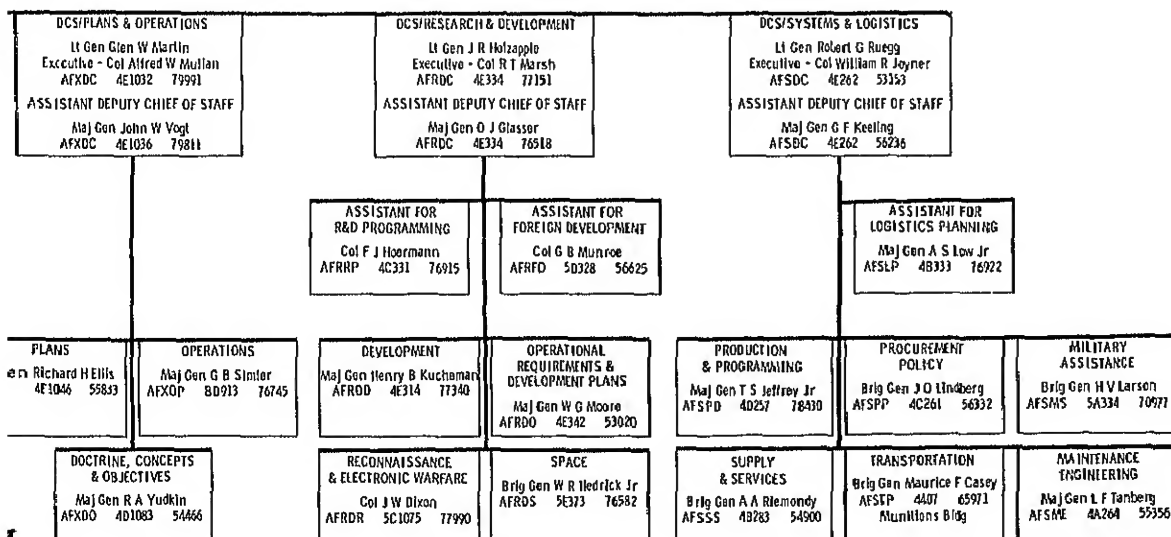
Defense Procurement Circular No. 63, Sept. 30, 1968. (1) Competition and Price Representation in Small Purchases. (2) Cost Sharing Policy. (3) Providing Government Facilities to Contractors. (4) Utilization of Industrial Plant Equipment. (5) Organization and Publication of the ASPR. (6) Exchange of Sale of Personal Property. (7) Revision of DD Form 250. (8) Procurement Reporting. (9) Discounts Clause.

Defense Procurement Circular No. 64, Oct. 28, 1968. (1) Procurement of Equipment Under \$1,000 for Non-Profit Organizations. (2) Placement of Subcontracts and Location of Contractor Facilities in Labor Surplus Areas. (3) Value Engineering—Consideration of Royalty Costs in Evaluation of Proposals. (4) Dating of Government Property Clauses. (5) Multi-Year Procurement. (6) Contractor Performance Evaluation. (7) Workmen's Compensation and War Hazard Insurance Overseas. (8) Service Contract Act. (9) Cost Principle—Relocation Costs. (10) Construction and Architect-Engineer Contracts. (11) Contracts for Preparation of Personal Property for Shipment, Government Storage and Performing Intra-City or Intra-Area Movement.





SECRETARY OF THE AIR STAFF
 Col W E Atwater
 AFESS 4E948 79296





ABOUT PEOPLE

DEPARTMENT OF THE ARMY

The President has approved and nominated for Senate confirmation the following promotions as indicated:

Major General:

Brig. Gen. John L. Klingenhagen, Asst. Dep. Chief of Staff (Supply and Maintenance) Office of Dep. Chief of Staff (Logistics); Brig. Gen. Walter J. Woolwine, Dir. of Procurement, Army Materiel Command; Brig. Gen. Hugh F. Foster Jr., Commanding General, Army Communications Systems Agency, Fort Monmouth, N.J.; Brig. Gen. Albert E. Milloy, Commanding General, John F. Kennedy Center for Special Warfare, Fort Bragg, N.C.; Brig. Gen. Francis P. Koisch, Dir., Civil Works for Comprehensive Basin Planning, Office, Chief of Engineers; and Brig. Gen. Robert B. Smith, Chief of Public Information and Dep. Chief of Information, Office of Secretary of the Army.

Brigadier General:

Col. Stewart C. Meyer, Missiles & Space Directorate, Office of Chief of Research & Development; Col. Richard C. Horne III, White Sands Missile Range, N.M.; Col. Donald V. Rattan, John F. Kennedy Center for Special Warfare; Col. George M. Bush, Office, Under Secretary of the Army; Col. George M. Snead Jr., Office, Asst. Chief of Staff (Communications-Electronics); and Col. Edward M. Dooley, Sentinel Systems Command, Huntsville, Ala.

Maj. Gen. Oren E. Hurlbut has been assigned as the new Commanding General, Army Weapons Command, Rock Island, Ill. He succeeds Brig. Gen. W. J. Durrenberger.

Col. Charles F. Frock is the new Dir., Ammunition Engineering Directorate, at Picatinny Arsenal, Dover, N.J.

Col. Robert A. Guenther is the new Commanding Officer, Combat Support Group, Army Combat Developments Command, Fort Belvoir, Va.

Col. Robert C. Marshall, who has been nominated for promotion to brigadier general, has succeeded Col. Hartsell H. Northington as Dir., Site Activation Directorate, Sentinel System Command, Huntsville, Ala.

Col. Eduardo M. Soler has been assigned duty as Commanding Officer, Army Aviation Materiel Laboratories, Fort Eustis, Va. He succeeds Col. Harry L. Bush, who has been reassigned as Dep. Commander for Research, Engineering and Data, Army Aviation Materiel Command, St. Louis, Mo.

Walter W. Hollis has been appointed to a newly created position as scientific adviser to the Commanding General, Army Combat Developments Command Experimentation Command, Fort Ord, Calif.

DEPARTMENT OF THE NAVY

RAdm. Paul L. Lacy Jr. has been assigned duty as Future Submarine Design Project Manager, for the Naval Material Command.

RAdm. William J. Moran has been named Dir. of the Space Program Div., Office of the Chief of Naval Operations.

Brig. Gen. Jay W. Hubbard, USMC, has succeeded Brig. Gen. F. E. Garretson, USMC, as Dir. of Information, Headquarters, U. S. Marine Corps.

Capt. Frank W. Ewald is the new Commander, Naval Air Development Center, Johnsville, Pa.

Capt. W. L. Goldenrath succeeds Capt. Roger Ireland as Dir., Aerospace Crew Equipment Dept., Naval Air Engineering Center, Philadelphia, Pa.

Capt. Robert E. Vogel has assumed duties as Commanding Officer, Navy Subsistence Office, and Dep. Commander for Navy Food Service Programs, Naval Supply Systems Command.

Dr. Joel S. Lawson Jr. has been appointed as Dir. of Navy Laboratories by the Asst. Secretary of the Navy (Research & Development).

DEPARTMENT OF THE AIR FORCE

Col. Bernice S. Barr has been assigned as Executive, Air Force Special Weapons Center, Air Force Systems Command, Kirtland AFB, N.M.

Col. Donald W. Bowry is the new Chief of the Technical Requirements & Standards Office, Electronics Systems Div., Air Force Systems Command, L. G. Hanscom Field, Mass.

Col. Walter A. Brown Jr., has been named Chief, Contractor Administration Branch, Directorate of Procurement Policy, Office of Dep. Chief of Staff (Systems & Logistics), USAF Hq.

Col. Albert L. Guidera has been assigned as Chief, Configuration Management Div., (Minuteman), Space & Missile Systems Organization, Air Force Systems Command, Los Angeles, Calif.

Col. Perry L. Hutie is the new Dir. of Planning and Technology at the Electronic Systems Div., Air Force Systems Command, L. G. Hanscom Field, Mass.

Col. Truman O'Keefe has been named Dir. of Civil Engineering, Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

The Air Force Missile Development Center, Holloman AFB, N.M., has a new Dir. of Materiel. He is Col. Frank G. Uhling.

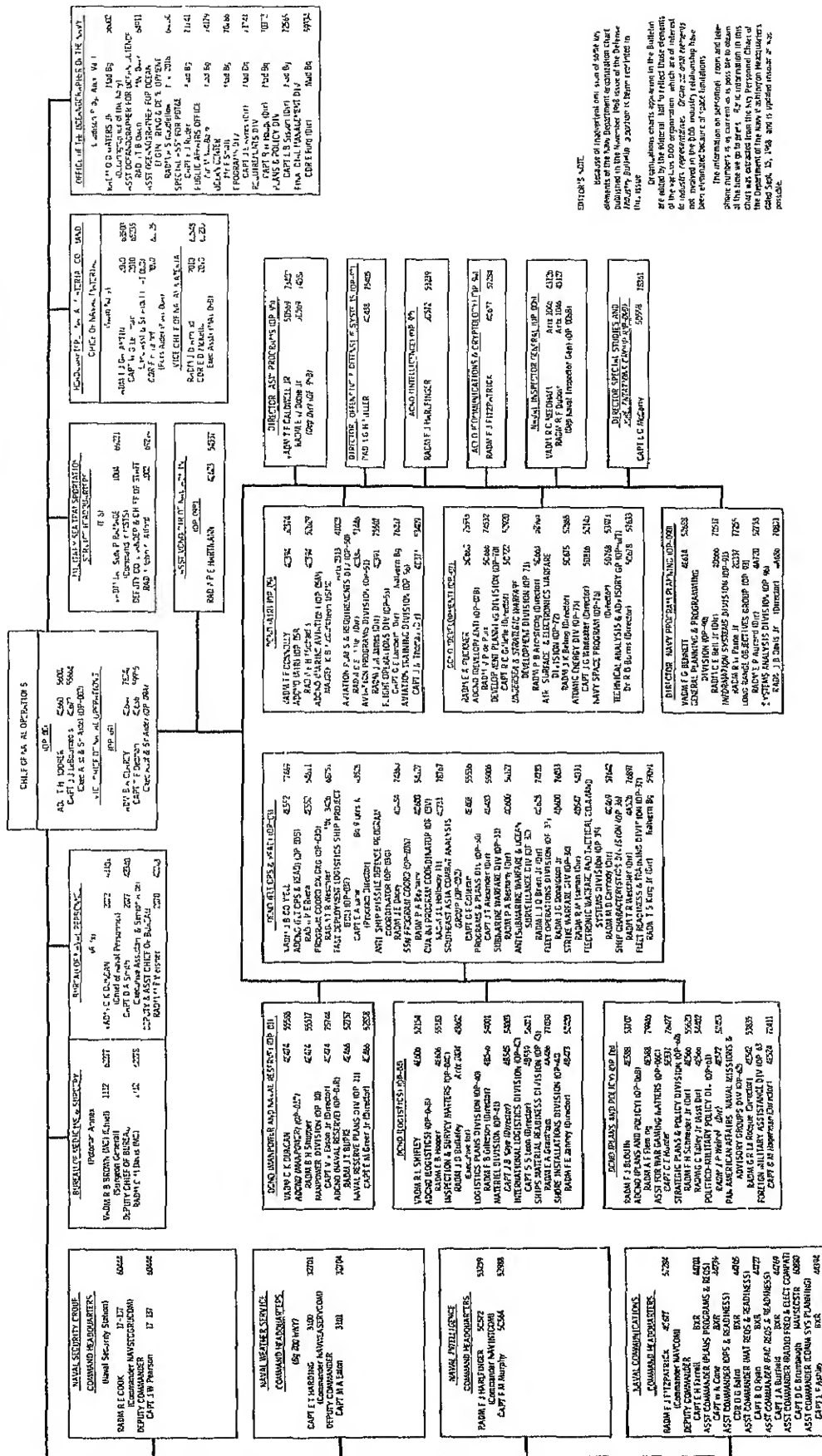
Col. E. H. Vernon has been transferred to the Advanced Logistics Systems Center, Wright-Patterson AFB, Ohio, where he will serve as Chief of the Acquisition & Technical Management Systems Div. at the Air Force Logistic Command agency.

Col. Robert M. White has been named Dir. of the FX System Program Office, Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

KEY PERSONNEL CHART

OFFICE OF THE CHIEF OF NAVAL OPERATIONS, WASHINGTON, D. C.
AND SUBORDINATES

Telephone (202) Oxford plus extension



OFFICE OF THE CHIEF OF NAVAL OPERATIONS, WASHINGTON, D. C.

Army Aviation Materiel Command Reorganized and Renamed

The U.S. Army Aviation Materiel Command (AVCOM), headquartered in the Mart Building at 12th and Spruce Streets, St. Louis, Mo., has been reorganized and renamed. The new name is the U.S. Army Aviation Systems Command (AVSCOM).

Under the command of Major General John Norton, AVSCOM is responsible for the design, production and maintenance of Army aircraft. This responsibility includes the research and initial development of a new aircraft type, the testing of the new equipment, contracting for its production, providing repair parts and maintenance assistance to the field army, and providing international logistical support to other countries which use the same types of aircraft as the U.S. Army.

Under the new AVSCOM organization, the technical operations have been separated from the staff and supporting elements:

- Deputy Commanding General and Chief of Staff, Brigadier General John P. Traylor, is responsible for staff and supporting functions such as personnel, comptroller, automatic data processing, legal and facilities management.

- Deputy Commander for Research, Engineering and Data, Colonel Harry L. Bush, also commands the AVSCOM Research, Engineering and Data Activity which is responsible for the entire scope of aviation engineering, to include research at the Aviation Materiel Laboratories, Fort Eustis, Va., and flight testing at the Aviation Systems Test Activity, Edwards AFB, Calif. His organization also provides engineering support for aircraft already deployed in the field.

- Deputy Commander for Acquisition, Colonel Clifton O. Duty, also commands the AVSCOM Acquisition Activity which is responsible for the procurement and production of aircraft, engines, repair parts and services, and for assuring that quality standards established for the equipment are met.

- Deputy Commander for Logistics Support, Colonel Delbert L. Bristol, also commands the AVSCOM Logis-

tics Support Activity which is responsible for the logistical support of Army aircraft in the field, providing repair parts, maintenance assistance, technical manuals, and for determining the requirements to support future operations. His maintenance responsibilities include command of the U.S. Army Aeronautical Depot Maintenance Center, Corpus Christi, Tex., which maintains and overhauls turbine engines and all types of Army aircraft.

The new organization is expected to provide a greater capability for intensive management of Army aircraft systems throughout their life span. Major benefits should be derived in terms of improved support of combat forces and more efficient development and procurement.

Air Force Invites FX Proposals

The Air Force has invited eight aircraft companies to submit proposals for contract definition of an advanced tactical fighter aircraft designated the FX.

The FX program calls for the acquisition of a highly maneuverable, single place, twin-engine jet fighter with initial operational capability in the mid-1970s.

Initial engine development contracts for the FX were announced Aug. 27. First flight of the new aircraft is expected in 1972.

Primary mission of the FX will be to achieve and maintain air superiority. The plane will have significantly better air-to-air performance than any known fighter aircraft.

Companies invited to submit proposals are: The Boeing Co., Seattle, Wash.; Fairchild-Hiller Corp., Farmingdale, N.Y.; General Dynamics Corp., Fort Worth, Tex.; Grumman Aircraft Engineering Corp., Bethpage, N.Y.; Lockheed Aircraft Corp., Burbank, Calif.; McDonnell-Douglas Corp., St. Louis, Mo.; North American Rockwell Corp., Los Angeles, Calif.; and Northrop Corp., Hawthorne, Calif.

Navy Annual Oceanography Symposium Set

The Sixth Annual U.S. Navy Symposium on Military Oceanography will be held May 26-28, 1969, at the Seattle Center Playhouse, in Seattle, Wash.

The three-day meeting will feature some of the nation's leading oceanographers from industry, the academic community, the Military Services and the Federal Government.

Host for the symposium will be Dr. J. E. Henderson, Director of the Applied Physics Laboratory at the University of Washington.

Invitations to present papers and applications for attendance will be issued in January 1969. Information concerning the symposium can be obtained by contacting the Office of the Oceanographer of the Navy, (Attn: Code N812), 732 N. Washington St., Alexandria, Va. 22314; or Dr. J. E. Henderson, Applied Physics Laboratory, University of Washington, Seattle, Wash. 98105.

The symposium is sponsored annually by the Oceanographer of the Navy. The 1968 meeting was held in Panama City, Fla.

Army Establishes New Research Unit

The U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., has provisionally formed a new element to perform research in matters of civil affairs, psychological operations, stability operations, and unconventional warfare.

Called the Institute of Strategic and Stability Operations, the new unit will be headquartered at Fort Bragg, N.C., under the command of Colonel Francis J. Kelly.

The new unit was formed by combining the former Special Warfare Agency, Fort Bragg, with the Civil Affairs Agency, Fort Gordon, Ga. The civil affairs element of the institute will continue to collocate with the Civil Affairs School at Fort Gordon.

Special emphasis will be given by the institute to low intensity conflict including military assistance and advisory efforts.

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BUSH Sales Aid Contractors and Government. By Lieutenant Colonel Felix H. Jewell, USAF, and Mrs. Jane Litchfield	4	Dec.
(The) Defense Market System. By Lt. Col. David I. Cleland, USAF, and 1st Lt. William R. King, USAF	7	Jan.
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(The) Caliber of U.S. Seapower. (Speech) Adm. Thomas H. Moorer, USN -----	25	May
(The) Challenge of the Marine Sciences. By Vice President Hubert H. Humphrey -----	6	Feb.
Deep Submergence Progress, Problems and Plans. By Capt. William M. Nicholson, USN -----	22	Feb.
Defense Research, Development, Test and Evaluation Program for FY 1969. (Speech) Dr. John S. Foster Jr. -----	27	April
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Managing Research and Development Pro- grams. (Speech) Dr. John S. Foster Jr. -----	10	Dec.
Marine Science Affairs: Impetus and Promise. By Dr. Edward Wenk Jr. -----	7	Feb.
Oceanography's Role in Defense. By RAdm. O. D. Waters Jr., USN -----	11	Feb.
Research and Development Objectives for Future Defense Communications System. By Col. John P. Walsh, USAF and Lt. Col Richard S. Barry, USMC -----	10	Oct.
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Small Business Develops Navy Jungle Rescue Device	20	May

Status of Funds Quarterly Report

Expenditures

Fourth Quarter, Fiscal Year 1968

(Thousands of Dollars)

Department of Defense	Expenditures				Unpaid obligations	
	April 1968	May 1968	June 1968	Cum thru June 30, 1968	At start of year	As of June 30, 1968
Military Personnel						
Active forces	1,668,809	1,700,569	1,937,242	18,987,619	850,076	761,917
Reserve forces	60,912	70,740	88,177	871,425	149,863	149,746
Retired pay	184,700	185,719	187,030	2,094,746	7,622	0,880
Undistributed	-24,342	91,887	-44,966	—	—	—
Total—Military Personnel	1,890,078	2,048,898	2,167,482	21,953,789	1,007,561	918,543
Operation and Maintenance	1,731,488	1,709,957	2,249,622	20,577,826	a 3,542,486	4,039,198
Procurement						
Aircraft	810,391	728,963	748,202	9,466,788	a 9,317,974	9,591,228
Missiles	193,718	185,947	215,288	2,228,495	1,929,015	2,069,735
Ships	214,848	-83,418	106,368	1,355,861	3,049,781	9,447,418
Tracked combat vehicles	36,954	64,506	49,913	482,644	632,680	610,190
Ordnance, vehicles, and related equipment	516,374	595,452	883,740	6,396,808	6,721,730	6,595,367
Electronics and communications	140,228	156,260	198,252	1,620,299	1,998,176	1,881,384
Other procurement	133,362	203,292	105,056	2,110,765	1,947,502	2,056,183
Undistributed	64,817	-232,972	-260,115	-878,831	-880,056	-7,225
Total—Procurement	2,109,192	1,608,031	2,040,705	23,282,719	25,210,802	20,244,228
Research, Development, Test, and Evaluation						
Military sciences	86,989	67,856	91,737	1,013,968	867,881	77,774
Aircraft	117,564	279,698	109,104	1,366,679	796,125	717,451
Missiles	198,647	200,551	174,508	2,488,374	1,095,907	983,018
Astronautics	96,677	103,883	124,900	1,220,757	649,793	487,480
Ships	20,977	10,309	15,175	272,170	212,773	245,279
Ordnance, vehicles, and related equipment	33,549	30,793	24,036	350,168	235,442	216,577
Other equipment	68,789	67,921	73,243	783,601	541,757	478,981
Program-wide management and support	30,405	30,560	29,016	444,766	163,038	189,388
Undistributed	-28,509	-109,598	-41,545	-102,809	-194,032	-1,683
Total—Research, Development, Test, & Eval.	625,088	631,978	600,228	7,747,380	4,368,185	4,094,265
Military Construction	97,123	138,221	77,188	1,281,339	1,581,256	1,784,255
Family Housing	43,819	44,744	36,526	494,903	114,964	174,687
Civil Defense	9,016	10,638	7,330	107,837	91,893	80,629
Other—Special Foreign Currency Program	66	-2	445	1,724	2,193	1,071
Revolving and Management Funds	336,598	669,506	98,519	2,089,944	8,440,858	6,077,121
Subtotal—Military Functions	6,842,468	6,911,967	7,278,049	77,597,260	b 44,360,197	b 43,407,998
Military Assistance	63,836	73,982	89,491	600,926	2,112,357	1,828,034
TOTAL—DEPARTMENT OF DEFENSE	6,965,808	6,985,949	7,367,540	78,138,186	b 46,472,554	b 45,231,032
Department of the Army						
Military Personnel						
Active forces	778,029	688,828	892,403	7,765,096	392,872	382,077
Reserve forces	36,427	46,608	59,853	567,020	112,152	112,578
Undistributed	-6,111	60,127	-21,535	—	—	—
Total—Military Personnel	808,345	801,563	930,221	8,332,122	505,024	494,654
Operation and Maintenance	697,720	698,304	1,052,579	8,204,779	1,252,029	1,541,708
Procurement						
Aircraft	112,269	102,562	106,212	1,144,536	1,303,795	1,343,518
Missiles	32,763	36,781	64,714	403,002	458,264	629,712
Tracked combat vehicles	35,667	54,267	47,715	477,416	611,193	586,046
Ordnance, vehicles, and related equipment	158,190	285,902	385,737	2,854,559	3,387,912	3,445,481
Electronics and communications	40,447	65,969	110,844	663,877	780,554	688,774
Other procurement	67,050	75,485	-30,444	685,852	817,800	769,610
Undistributed	60,796	-233,688	-243,888	-378,831	-380,056	-7,225
Total—Procurement	513,182	387,268	440,890	5,841,011	6,972,842	7,455,816
Research, Development, Test, and Evaluation						
Military sciences	11,722	10,864	13,138	154,520	133,665	98,272
Aircraft	7,623	8,714	7,667	130,568	85,463	78,199
Missiles	57,814	67,481	84,814	717,837	435,876	386,366
Astronautics	1,067	1,260	1,167	17,784	15,069	7,865
Ordnance, vehicles, and related equipment	11,822	20,211	16,193	137,152	136,432	110,532
Other equipment	28,740	29,299	42,707	337,306	218,437	196,748
Program-wide management and support	9,391	4,877	5,198	31,338	39,835	33,898
Undistributed	-23,663	-110,715	-45,036	-102,399	-104,032	-1,633
Total—Research, Development, Test, & Eval	99,522	31,992	125,787	1,434,096	870,745	910,247
Military Construction	46,220	87,206	26,823	677,986	818,076	768,046
Revolving and Management Funds	128,534	293,672	-104,081	804,241	2,892,551	1,954,616
TOTAL—DEPARTMENT OF THE ARMY	2,293,523	2,304,992	2,472,222	25,294,236	13,311,268	13,125,087

a Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,300 thousand.

b Differs from prior reports due to inclusion of gross unpaid obligations for Stock and Industrial Funds not previously reflected in this report.

NOTE: Detail may not add to rounded totals.

Department of the Navy	Expenditures				Unpaid obligations	
	April 1968	May 1968	June 1968	Cum thru June 30, 1968	At start of year	As of June 30, 1968
Military Personnel						
Active forces	413,687	549,408	538,085	5,567,072	232,405	225,093
Reserve forces	13,546	12,860	15,682	153,790	19,698	22,898
Undistributed	-15,858	8,310	-7,489	—	—	—
Total—Military Personnel	411,374	570,578	546,278	5,720,862	252,103	247,991
Operation and Maintenance	408,192	408,826	548,762	5,164,016	1,234,096	1,466,352
Procurement						
Aircraft	276,893	262,068	273,808	3,248,717	3,505,672	3,218,049
Missiles	41,878	40,759	19,058	437,053	470,557	547,934
Ships	214,848	-83,418	106,368	1,365,851	3,049,781	3,447,418
Tracked combat vehicles	287	249	2,198	5,128	21,547	24,144
Ordnance, vehicles, and related equipment	147,482	150,850	156,979	1,617,583	1,611,746	1,713,934
Electronics and communications	61,520	57,610	49,516	626,072	656,977	646,301
Other procurement	3,740	75,293	62,923	806,261	921,116	1,143,225
Undistributed	2,073	-6,357	-9,627	—	—	—
Total—Procurement	738,659	498,061	661,221	7,991,665	10,236,796	10,740,005
Research, Development, Test, and Evaluation						
Military sciences	14,291	3,895	14,487	181,703	127,823	121,458
Aircraft	25,602	16,105	22,382	316,298	250,838	257,524
Missiles	55,775	59,841	11,858	803,668	293,783	258,025
Astronautics	1,448	-3,338	500	16,042	12,677	16,259
Ships	20,977	10,309	15,175	272,170	212,773	245,279
Ordnance, vehicles, and related equipment	21,727	10,582	7,903	163,016	99,010	108,045
Other equipment	11,126	14,400	7,754	133,196	89,328	79,604
Program-wide management and support	662	6,464	4,402	112,534	97,939	193,064
Undistributed	-48	1,669	4,479	—	—	—
Total—Research, Development, Test, & Eval.	151,560	119,912	88,890	2,002,627	1,193,721	1,217,258
Military Construction	11,244	11,739	16,094	92,067	269,300	573,575
Revolving and Management Funds	119,508	381,369	253,328	1,134,184	3,234,657	2,269,078
TOTAL—DEPARTMENT OF THE NAVY	1,840,536	1,990,533	2,114,571	22,108,321	16,421,272	16,514,258

Department of the Air Force

Military Personnel						
Active forces	477,098	462,817	506,754	5,655,461	224,799	154,747
Reserve forces	10,940	11,272	13,142	159,609	18,013	14,270
Undistributed	-2,373	17,449	-15,941	—	—	—
Total—Military Personnel	485,665	491,038	503,955	5,806,000	242,812	169,017
Operation and Maintenance	538,701	520,024	561,129	6,211,171	955,856	927,881
Procurement						
Aircraft	421,289	364,333	368,182	5,078,535	4,508,567	5,029,659
Missiles	119,077	108,407	131,518	1,387,840	1,000,194	892,089
Ordnance, vehicles & related equipment	210,623	158,473	339,955	1,920,525	1,719,842	1,134,835
Electronics and communications	41,799	31,712	37,162	432,925	555,915	539,008
Other procurement	60,635	49,440	70,890	587,864	164,740	100,001
Undistributed	1,316	6,311	-12,658	—	—	—
Total—Procurement	854,739	718,674	935,050	9,407,689	7,949,258	7,995,592
Research, Development, Test, and Evaluation						
Military sciences	13,351	14,088	13,525	166,928	131,619	104,162
Aircraft	84,933	254,879	79,105	920,823	449,324	381,728
Missiles	85,058	73,229	77,831	961,869	366,248	398,627
Astronautics	94,162	105,961	123,293	1,186,931	622,047	463,356
Other equipment	28,923	24,222	22,782	312,999	233,992	202,629
Program-wide management and support	20,852	19,229	19,416	250,804	25,214	22,376
Undistributed	202	-642	-988	—	—	—
Total—Research, Development, Test & Eval.	326,381	491,068	334,964	3,800,444	1,828,944	1,512,878
Military Construction	38,883	38,178	33,518	492,064	473,206	425,858
Revolving and Management Funds	88,659	49,658	-53,697	74,625	441,102	521,170
TOTAL—DEPARTMENT OF THE AIR FORCE	2,833,026	2,908,635	2,909,951	25,792,054	11,891,177	11,552,396

* Differs from amounts reported June 30, 1967, due to reclassification of Aircraft and Related Procurement, Navy from "Procurement" to "Operation and Maintenance." Amount \$37,900 thousand.

Defense Agencies/Office of the Secretary of Defense	Expenditures				Unpaid obligations	
	April 1968	May 1968	June 1968	Cum thru June 30, 1968	At start of year	As of June 30, 1968
Military Personnel						
Retired pay	184,700	185,719	187,030	2,094,746	7,622	6,880
Operation and Maintenance	86,875	82,804	87,163	997,860	99,905	97,258
Procurement						
Ordnance, vehicles, and related equipment	79	227	1,069	4,141	2,230	1,117
Electronics and communications	462	973	730	7,425	5,330	8,251
Other procurement	1,937	8,078	1,687	30,788	44,346	48,447
Undistributed	182	-288	68	—	—	—
Total—Procurement	2,611	4,040	3,544	42,364	51,906	52,815
Research, Development, Test, and Evaluation						
Military sciences	47,625	39,009	50,587	510,212	474,774	453,882
Military Construction	777	1,049	752	18,322	20,674	16,777
Family Housing	43,819	44,744	36,526	494,903	114,964	174,687
Other—Special Foreign Currency Program	66	—	445	1,724	2,193	1,071
Revolving and Management Funds	-104	-60,192	7,940	76,894	1,872,548	1,332,258
TOTAL—DEFENSE AGENCIES/OSD	366,368	297,170	378,975	4,237,018	2,644,586	2,135,628
Office of Civil Defense						
Civil Defense	9,016	10,638	7,330	107,637	91,893	80,620
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	9,016	10,638	7,330	107,637	91,893	80,620
Military Assistance						
Military Personnel	22	17	18	271	525	363
Operation and Maintenance	24,080	21,702	27,624	257,534	289,568	230,840
Procurement						
Aircraft	7,767	7,775	8,414	82,091	235,101	226,880
Missiles	-980	366	1,454	6,349	23,650	16,036
Ships	590	25,892	755	43,362	114,450	43,984
Ordnance, vehicles, and related equipment	14,008	12,880	24,295	125,297	264,633	192,733
Electronics and communications	5,618	3,115	6,942	46,131	132,402	101,236
Other procurement	9,142	6,102	8,807	54,254	127,226	88,420
Total—Procurement	30,130	55,620	50,697	355,484	897,462	669,202
Research, Development, Test, and Evaluation	—	-88	-1	-1,019	401	35
Military Construction	238	—	241	3,182	171,824	6,809
Revolving Fund	4,207	-1,948	-7,848	-17,746	704,607	848,233
Undistributed	-1,340	-1,870	18,259	8,220	-12,030	67,472
TOTAL—MILITARY ASSISTANCE	68,836	78,982	89,491	600,926	2,112,357	1,823,034

Obligations

Department of Defense	Available for obligation	Obligations				Unobligated balance June 30, 1968
		April 1968	May 1968	June 1968	Cum thru June 30, 1968	
Military Personnel						
Active forces	19,291,780	1,022,424	1,640,115	1,706,639	19,277,720	14,060
Reserve forces	924,671	69,832	74,808	121,921	876,695	48,030
Retired pay	2,095,000	184,668	185,676	187,608	2,093,478	1,522
Total—Military Personnel	22,311,451	1,866,825	1,900,098	2,016,069	22,247,833	63,618
Operation and Maintenance	23,035,127	1,932,210	1,806,663	2,959,626	22,990,259	44,870
Procurement	13,629,768	869,842	1,106,795	1,767,270	10,145,973	3,383,795
Missiles	3,138,694	240,491	110,627	252,152	2,489,109	644,586
Ships	4,769,125	90,859	258,387	378,578	1,869,376	2,893,749
Tracked combat vehicles	561,207	63,767	27,302	116,255	471,693	89,514
Ordnance, vehicles, and related equipment	9,639,673	568,328	418,653	964,414	7,771,487	1,768,180
Electronics and communications	2,389,988	139,611	123,191	379,690	1,614,698	774,690
Other procurement	3,377,786	276,303	262,728	378,368	2,518,256	859,533
Undistributed	286,648	—	—	—	—	286,648
Total—Procurement	37,681,290	2,239,097	2,307,679	4,236,632	26,880,592	10,700,698
Research, Development, Test, & Evaluation						
Military sciences	1,141,124	55,282	88,682	127,486	992,312	148,812
Aircraft	1,421,470	86,806	63,731	127,223	1,293,213	128,252
Missiles	2,528,622	93,806	95,702	164,234	2,466,225	60,697
Astronautics	1,238,646	133,787	69,472	98,250	1,165,202	72,344
Ships	973,827	20,490	26,947	34,690	924,179	49,148
Ordnance, vehicles, and related equipment	399,145	16,113	16,133	46,277	341,773	57,372
Other equipment	935,070	50,006	49,810	39,103	743,614	191,466
Program-wide management and support	739,103	50,356	52,986	94,921	673,166	65,937
Emergency Fund	—	—	—	—	—	—
Undistributed	84,931	—	—	—	—	84,931
Total—Research, Development, Test, & Eval.	8,859,938	512,144	463,465	786,133	8,000,388	858,950
Military Construction	3,376,956	126,289	202,659	486,621	1,784,359	1,592,598
Family Housing	878,745	58,153	52,681	70,277	645,127	228,618
Civil Defense	108,661	5,082	7,845	19,718	100,184	8,427
Other	72,676	169	276	—	602	71,974
Subtotal—Military Functions	36,210,044	3,737,911	3,830,765	10,525,024	32,649,293	13,559,751
Military Assistance	405,656	42,638	39,223	152,270	400,656	5,001
TOTAL—DEPARTMENT OF DEFENSE	96,624,700	6,780,494	6,869,988	10,677,294	83,049,949	13,574,752

Department of the Army	Available for obligation	Obligations				Unobligated balance June 30, 1968
		April 1968	May 1968	June 1968	Cum thru June 30, 1968	
Military Personnel						
Active forces	7,928,001	689,419	681,511	735,521	7,922,908	5,093
Reserve forces	608,076	36,743	61,521	85,652	671,717	36,369
Total—Military Personnel	8,536,077	726,162	733,032	821,173	8,494,625	41,462
Operation and Maintenance	9,270,460	714,590	794,697	1,458,566	9,247,034	23,426
Procurement						
Aircraft	1,532,161	51,998	295,172	325,285	1,194,728	337,433
Missiles	711,080	45,730	25,512	61,010	629,902	81,173
Tracked combat vehicles	534,966	53,268	25,037	115,566	463,969	70,993
Ordnance, vehicles and related equipment	5,350,496	455,357	230,934	655,067	4,405,522	944,974
Electronics and communications	914,510	25,251	63,989	130,459	624,035	290,475
Other procurement	1,162,606	99,173	163,743	144,056	838,050	321,556
Undistributed	284,594	—	—	—	—	284,594
Total—Procurement	10,490,413	730,777	794,387	1,481,443	8,156,205	2,231,208
Research, Development, Test, & Evaluation						
Military sciences	186,365	8,469	8,832	17,830	168,332	28,033
Aircraft	161,819	6,542	8,202	16,911	124,617	37,202
Missiles	700,598	17,030	10,357	53,593	633,884	16,714
Astronautics	12,181	—82	1,087	1,719	10,685	1,496
Ordnance, vehicles and related equipment	209,051	4,849	8,248	24,076	171,625	37,426
Other equipment	452,172	25,382	30,810	48,480	327,840	124,333
Program-wide management and support	87,534	3,416	4,082	5,495	80,393	7,141
Undistributed	58,994	—	—	—	—	58,994
Total—Research, Development, Test & Eval.	1,868,714	65,606	71,068	167,134	1,557,885	311,829
Military Construction	1,438,099	60,536	117,400	153,792	725,239	712,860
TOTAL—DEPARTMENT OF THE ARMY	31,608,764	2,286,672	2,510,590	4,082,108	28,180,488	3,423,275

Department of the Navy

Military Personnel						
Active forces	5,046,272	475,524	487,004	514,466	5,044,140	2,132
Reserve forces	160,462	12,679	12,127	18,736	167,094	3,368
Total—Military Personnel	5,206,734	488,203	499,132	533,201	5,1, 1,234	5,600
Operation and Maintenance	6,104,588	603,852	431,023	732,446	6,098,669	5,919
Procurement						
Aircraft	4,147,035	469,492	359,824	542,557	2,982,895	1,161,140
Missiles	744,524	63,725	20,362	39,072	631,677	212,847
Ships	4,763,125	90,859	258,387	378,578	1,869,376	2,893,749
Tracked combat vehicles	26,241	409	2,265	689	7,725	18,516
Ordnance, vehicles and related equipment	2,161,185	72,156	72,640	140,254	1,727,421	433,764
Electronics and communications	785,215	58,204	26,592	132,356	522,999	262,216
Other procurement	1,550,386	120,100	62,400	151,629	1,115,083	435,303
Undistributed	—4,100	—	—	—	—	—4,100
Total—Procurement	14,173,611	875,035	802,468	1,385,137	8,757,176	5,416,435
Research, Development, Test, and Evaluation						
Military sciences	188,889	9,942	20,470	12,923	183,099	5,790
Aircraft	866,090	24,336	6,068	66,297	312,248	43,842
Missiles	815,656	24,303	27,119	41,805	785,146	30,510
Astronautics	24,194	426	1,097	605	19,739	4,455
Ships	373,327	20,490	26,947	34,630	324,179	49,148
Ordnance, vehicles and related equipment	190,094	11,264	7,885	22,201	170,148	19,946
Other equipment	146,170	9,552	4,994	18,281	125,453	20,717
Program-wide management and support	384,239	29,443	29,516	63,181	328,637	55,602
Undistributed	—	—	—	—	—	—
Total Research, Development, Test & Eval.	2,478,650	129,806	124,096	259,983	2,248,649	230,010
Military Construction	1,106,127	43,474	73,839	156,838	598,110	508,017
TOTAL—DEPARTMENT OF THE NAVY	29,669,720	2,140,369	1,930,569	3,067,404	23,503,837	6,165,883

Department of the Air Force	Available for obligation	Obligations				Unobligated balance June 30, 1968
		April 1968	May 1968	June 1968	Cum thru June 30, 1968	
Military Personnel						
Active forces	5,717,507	457,481	471,599	456,653	5,710,672	6,835
Reserve forces	166,133	11,410	10,660	17,533	147,824	8,309
Total—Military Personnel	5,873,640	468,892	482,257	474,187	5,858,496	15,144
Operation and Maintenance	6,604,394	626,735	493,897	669,876	6,591,880	12,511
Procurement						
Aircraft	7,850,572	348,352	451,799	899,428	5,968,350	1,882,222
Missiles	1,678,090	131,035	64,653	152,070	1,327,530	350,560
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	2,023,172	40,577	113,815	169,140	1,635,516	387,656
Electronics and communications	675,220	54,744	30,868	65,278	457,318	218,908
Other Procurement	696,101	55,160	43,538	74,049	523,132	72,972
Undistributed	—	—	—	—	—	—
Total—Procurement	12,224,161	629,858	704,668	1,359,965	9,911,846	2,912,315
Research, Development, Test, & Evaluation						
Military sciences	176,472	8,411	10,619	15,648	156,083	20,339
Aircraft	903,561	55,378	49,461	41,985	856,353	47,208
Missiles	1,010,368	52,473	58,226	68,836	996,895	13,473
Astronautics	1,202,171	133,443	67,288	95,926	1,135,778	66,393
Other equipment	336,728	15,072	14,506	26,342	290,312	46,416
Program-wide management and support	267,330	23,497	19,438	26,245	264,136	3,194
Undistributed	25,937	—	—	—	—	25,937
Total—Research, Development, Test & Eval.	3,922,567	288,273	219,539	277,982	3,699,557	223,010
Military Construction	783,512	29,629	99,393	122,046	446,585	336,927
TOTAL—DEPARTMENT OF THE AIR FORCE	30,008,273	1,943,387	1,999,754	2,903,857	26,508,365	3,199,908

Defense Agencies/Office of the Secretary of Defense

Military Personnel						
Retired Pay	2,095,000	184,568	185,675	187,508	2,093,478	1,522
Operation and Maintenance	1,055,685	87,033	87,047	98,835	1,052,674	3,011
Procurement						
Ordnance, vehicles and related equipment	4,820	238	1,281	—44	3,028	1,792
Electronics and communications	13,437	1,312	1,747	1,497	10,346	3,091
Other procurement	68,693	1,880	3,047	8,634	41,991	26,702
Undistributed	6,154	—	—	—	—	6,154
Total—Procurement	93,104	3,430	6,055	10,087	55,365	37,739
Research, Development, Test, and Evaluation						
Military sciences	589,398	28,460	48,761	81,085	494,798	94,600
Emergency Fund	—	—	—	—	—	—
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test & Eval.	589,398	28,460	48,761	81,085	494,798	94,600
Military Construction	49,218	2,650	2,021	3,944	14,424	34,794
Family Housing	873,745	56,153	52,681	70,277	645,127	228,618
Other—Special Foreign Currency Program	72,576	169	276	—1	602	71,974
TOTAL—DEFENSE AGENCIES/OSD	4,828,726	362,452	382,510	451,737	4,356,409	472,258

Office of Civil Defense

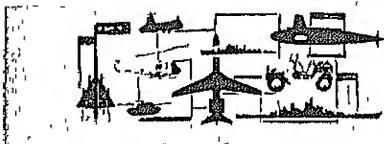
Civil Defense	108,561	5,032	7,345	19,718	100,134	8,427
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Military Assistance

Military Personnel	52	18	—3	54	52	—
Operation and Maintenance	203,130	36,226	11,792	14,702	198,129	6,001
Procurement						
Aircraft	77,215	1,241	10,939	55,595	77,215	—
Missiles	—2,461	1,114	—431	578	—2,461	—
Ships	15,963	—8	1,562	6,492	15,963	—
Ordnance, vehicles and related equipment	71,511	464	5,729	44,590	71,511	—
Electronics and communications	26,397	433	7,124	19,239	26,397	—
Other procurement	28,462	2,829	2,189	10,821	28,462	—
Total—Procurement	217,187	6,073	27,112	137,310	217,187	—
Research, Development, Test, and Evaluation	—1,342	—15,037	14,996	—	—1,342	—
Military Construction	—13,875	15,279	—14,664	192	—13,375	—
Undistributed	6	24	—9	12	6	—
TOTAL—MILITARY ASSISTANCE	406,656	42,583	39,223	152,270	400,656	6,001

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Prepared by:
Directorate for Financial Analysis and
Control
Office of Assistant Secretary of De-
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DEFENSE PROCUREMENT

Contracts of \$1,000,000 and over awarded during the month of October 1968.

DEFENSE SUPPLY AGENCY

- 1—Nantex-Riviera Corp., New York, N.Y. \$2,311,868. 5,415,840 pairs of men's cotton drawers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0587.
- 2—U.S. Steel, Pittsburgh, Pa. \$1,086,512. 11,476,300 lbs. of zinc-coated corrugated steel sheets. Defense Industrial Supply Center, Philadelphia, Pa. DSA 600-69-C-2556.
- Carborundum Co., Niagara Falls, N.Y. \$15,809,310. 48,000 sets of body armor for the Army Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0548.
- 3—U.S. Steel, Pittsburgh, Pa. \$1,800,472. 11,476,300 lbs. of zinc-coated corrugated steel. Defense Industrial Supply Center, Philadelphia, Pa. DSA 600-69-C-3387.
- 7—Southern Packaging & Storage Co., Greenoville, Tenn. \$2,544,615. 3,406,796 cases of individual combat meals. Defense Personnel Support Center, Philadelphia, Pa. DSA 130-69-C-5017.
- 9—Glenberry Mfg., Inc., Commerce, Okla. \$1,374,310. 500,000 pairs of men's trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0510.
- Winfield Mfg., Inc., Winfield, Ala. \$1,076,000. 800,000 pairs of men's trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0539.
- 14—Sunlite Refining Co., Tulsa, Okla. \$2,789,472. 29,400,000 gallons of grade JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2246 P005.
- Sinclair Oil Corp., New York, N.Y. \$2,378,880. 25,200,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2237 P005.
- Humble Oil & Refining Co., Houston, Tex. \$1,762,513. 17,850,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2214 P006.
- Southwest Oil & Refining Co., Corpus Christi, Tex. \$1,651,440. 16,800,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-2240 P006.
- Riegel Textile Corp., New York, N.Y. \$2,679,320. 4,546,667 linear yards of cotton sateen cloth (46-inch) and 700,000 linear yards of 42-inch cotton sateen cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0569.
- Graniteville Co., New York, N.Y. \$2,207,710. 4,300,000 linear yards of 46-inch cotton sateen cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0570.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or Work to be Performed—Location of Work Performed (if other than company plant)—Contracting Agency—Contract Number.

- 23—Pittston Clinchfield Sales Corp., New York, N.Y. \$2,700,000. 450,000 tons of bituminous coal. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-C-0809.
- 24—National Steel Corp., Weirton, W. Va. \$2,137,879. 24,873,520 lbs. of corrugated steel sheets. Defense Industrial Supply Center, Philadelphia, Pa. DSA 50C-69-C-3456.
- Gulf Oil Corp., Houston, Tex. \$10,012,668. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0051.
- Hess Oil & Chemical Corp., Perth Amboy, N.J. \$3,487,530. Fuel oil and gasoline. Defense Fuel Supply Center Alexandria, Va. DSA 600-69-D-0056.
- Max Waller Co., Inc., Baltimore, Md. \$2,356,545. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0111.
- American Oil Co., Chicago, Ill. \$2,151,237. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0013.
- Charles J. McNulty, Inc., Riverside, N.J. \$1,000,840. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0004.
- 28—Dana Corp., Reading, Pa. \$1,467,163. 320,040 steel helmets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-0682.
- Kings Point Industries, Fayetteville, N.C. \$1,064,508. 75,000 armor protective vests, with collars. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-68-C-2375-P002.
- 31—Sun Oil Co., Philadelphia, Pa. \$8,462,130. 1,490,000 barrels of motor gasoline, Type I and 350,000 barrels of Grade DF-1 diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0550.
- Union Oil Co., Los Angeles, Calif. \$8,160,820. 3,280,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0558.
- Marathon Oil Co., Findlay, Ohio. \$4,270,070. 1,000,000 barrels of Grade DF-1 diesel fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0552.
- American Oil Co., Chicago, Ill. \$4,178,780. 930,000 barrels of marine diesel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0553.
- Powertine Oil Co., Santa Fe Springs, Calif. \$3,759,090. 1,500,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0557.
- Mobil Oil Corp., New York, N.Y. \$3,533,232. 480,000 barrels of marine diesel fuel oil; 8,000 barrels of kerosene and 840,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0555.
- Golden Eagle Refining Co., Los Angeles, Calif. \$2,317,410. 900,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0560.
- Atlantic Richfield Co., Los Angeles, Calif. 800,000 barrels of Navy special burner fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0556.
- Hess Oil & Chemical Corp., Woodbridge, N.J. \$1,892,000. 400,000 barrels of marine diesel and 200,000 barrels of number six fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0554.
- Edgington Oil Refineries, Long Beach, Calif. \$1,699,434. 600,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0559.



DEPARTMENT OF THE ARMY

- 1—Federal Electric Co., Paramus, N.J. \$1,977,000. Engineering, installation and testing of an integrated LOS microwave telecommunications system in the Federal Republic of Germany. Electronics Command, Fort Monmouth, N.J. DA AB07-69-C-0072.
- Dynallecton Corp., Washington, D.C. \$1,274,440 (modification to a previous contract). Three months operational extension for data collection and related support services. White Sands Missile Range, N.M. DA 29-040-AMC-01505 (R).
- Cornell Aeronautical Laboratories, Buffalo, N.Y. \$1,019,077. Services and materiel for an 18-month period to conduct investigation systems integration study and testing. Falls Church, Va. Electronics Command, Fort Monmouth, N.J. DA AB07-69-C-0069.
- Philco-Ford Corp., Newport Beach, Calif. \$1,499,970. FY 1969 research and development on the Chevalier missile program. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0542.
- AVCO Corp., Richmond, Va. \$1,145,621. (modification to a previous contract). Purchase of industrial plant equipment for the manufacture of components for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-33-008-AMC-00150 (A).
- Raytheon Co., Andover, Mass. \$1,519,657. Engineering and product assurance services for the Hawk missile system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0384.
- Martin-Marietta Corp., Orlando, Fla. \$1,785,584 (modification to a previous contract). Industrial engineering services in support of the Pershing weapon system. Army Missile Command, Huntsville, Ala. DA AH01-68-C-0267.
- MIF Industries, Inc., Branford, Conn. \$1,950,000. Type G lifting plug for heavy artillery projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0084.
- Dunbar & Sullivan Dredging Co., Cleveland, Ohio. \$2,069,250. Construction of a stone dike, Cuyahoga County, Ohio. Engineer Dist., Buffalo, N.Y. DA CW49-69-C-0013.
- 2—Lear Siegler, Inc., Anaheim, Calif. \$8,287,625. Metal parts for fuzes for 105mm cartridges. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0169.
- AVCO Corp., Stratford, Conn. \$2,843,371. Turbine nozzles for T-68 engines used on UH-1 helicopters. Aviation Materiel Command, St. Louis, Mo. AF-41 608-67-A-3234.
- Hughes Aircraft, Culver City, Calif. \$2,671,600. AN/VVS-1 laser range finder. Finkford Arsenal, Philadelphia, Pa. DA AA26-60-C-0153.
- Babcock & Wilcox Co., Detroit, Mich. \$1,418,750. Rapid boring lathes. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0201.
- White Motor Co., Lansing, Mich. \$8,082,283. 2½-ton trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06-69-C-0003.

- 3-FMC Corp., San Jose, Calif. \$11,287,730. M113A1 personnel carriers, XM730 Chaparral vehicles, and XM741 Vulcan vehicles. Tank Automotive Command, Warren, Mich. DA AE97-69-C-0472.
- Walter Kidde Co., Belleville, N.J. \$1,707,415. Metal parts for fuzes for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0163.
- Keystone Mfg. Corp., Boston, Mass. \$4,468,589. Metal parts for fuzes for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0154.
- Cleite Corp., Freeport, Ill. \$1,427,229 (contract modification). Dry batteries. Electronics Command, Philadelphia, Pa. DA AB05-69-C-2472.
- Union Carbide, New York, N.Y. \$2,796,692. Dry batteries. Electronics Command, Philadelphia, Pa. DA AB05-69-C-3095.
- Atlantic Research Corp., West Hanover, Mass. \$1,781,200. Loading and assembly of 60mm illuminating projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0165.
- 4-White Motor Corp., Lansing, Mich. \$2,536,068 (definitization of a previously awarded contract). 2 1/2-ton trucks General Purpose Vehicle Project Manager, Warren, Mich. DA AE08-67-C-5819.
- Honeywell, Inc., Hopkins, Minn. \$1,055,340. Fuzes for 40mm cartridges. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0487.
- Hensel Phelps Construction Co., Greeley, Colo. \$1,009,000. Construction of an Air National Guard facility. Forbes AFB, Kan. Engineer Dist., Kansas City, Mo. DA CA41-69-C0022.
- Colt's, Inc., Hartford, Conn. \$23,402,525. M16A1 rifles. Army Weapons Command, Rock Island, Ill. DA AF08-69-C-0021.
- 7-Consolidated Diesel Electric Co., Old Greenwich, Conn. \$12,211,480 (contract modification). Ten-ton tractor trucks. Scott, N.Y. Tank Automotive Command, Warren, Mich. DA AE07-67-C-5761.
- UMC Industries, Goodyear, Ariz. \$3,217,631. M18 gun w/c. Edgewood Arsenal, Md. DA AA15-69-C-0158.
- AVCO Corp., Richmond, Ind. \$2,016,900. Metal parts for 2.75-inch rocket components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0158.
- Bulova Watch Co., Jackson Heights, N.Y. \$1,410,232. Metal parts for 2.75-inch rockets. Woodside, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0195.
- 8-United Ammunition Container, Inc., \$2,495,087. Fiber ammunition containers for 81mm projectiles Milan, Tenn. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0232.
- AVCO Corp., Stratford, Conn. \$2,464,568. Engine components for UH-1 Iroquois helicopters. Aviation Materiel Command, St. Louis, Mo. AF-11-69-C-07-3234.
- 9-Darragh & Lyda, Inc., San Antonio, Tex. \$2,966,731. Construction of a composite medical facility at Bergstrom AFB, Tex. Engineer Dist., Fort Worth, Tex. DA CA83-69-C-0030.
- Shappert Engineering Co., Bellvidere, Ill. \$1,589,725. Construction work on a channel from Linwood, Iowa, to about the middle of Credit Island, Scott County, Iowa, and Rock Island County, Ill. Engineer Dist., Rock Island, Ill. DA CW23-69-D-0005.
- 10-Grumman Aircraft Engineering Corp., \$3,075,140. Remodernization of OV-1A Mohawk helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1561.
- Lockheed Aircraft, Plainfield, N.J. \$2,609,000. Radar set repair parts for the Vulcan Air Defense System. Army Procurement Agency, New York, N.Y. DA AG25-69-C-0856.
- Doelco Co., Morton, Pa. \$2,145,570. Rotary wing heads for CH-47 Chinook helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005.
- Pett Industries, St. Louis, Mo. \$1,933,760. Construction and delivery of a snag boat. Engineer Dist., Philadelphia, Pa. DA CW61-69-C-0042.
- Tepfer & Sons, Deer Park, N.Y. \$1,815,643. Adapters and fin assemblies for bombs. Edgewood Arsenal, Md. DA AA15-69-C-0160.
- Hayes Ablon Corp., Albion, Mich. \$1,597,320. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0128.
- Harvey Aluminum, Torrance, Calif. \$1,588,317. 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0178.
- Amron Corp., Waukesha, Wis. \$1,562,962. 40mm cartridge cases. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0177.
- Hayes International Corp., Birmingham, Ala. \$1,290,900. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0135.
- Aerojet General Corp., Downey, Calif. \$1,214,986. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0134.
- 11-Johnson Construction Co. and Massman Construction Co., Minneapolis, Minn. \$27,842,862. Construction of lock and appurtenant works at the Willow Island Lock and Dam Project on the Ohio River. Washington County, Ohio. Engineer Dist., Huntington, W. Va. DA CW69-69-C-0030.
- Becht Aircraft Corp., Wichita, Kan. \$2,137,215. Bomb dispensers. Salina, Kan. Army Procurement Agency, Chicago, Ill. DA AA09-69-C-0008.
- Cessna Aircraft Corp., Wichita, Kan. \$1,977,985. Bomb dispensers. Army Procurement Agency, Chicago, Ill. DA AA09-69-C-0007.
- Federal Laboratories, Saltsburg, Pa. \$1,140,221. Hand grenades. Edgewood Arsenal, Md. DA AA15-69-C-0177.
- General Motors, Detroit, Mich. \$3,341,000. Metal parts for 105mm projectiles. St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0108.
- Brunswick Corp., Lincoln, Neb. \$2,988,000. Grommets for 165mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0185.
- Brunswick Corp., Muskegon, Mich. \$2,046,660. Bomb dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0203.
- Automatic Sprinkler Corp., Dallas, Tex. \$1,990,674. Bomb dispensers. Carrollton, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0204.
- Kennedy Van Saun Corp., Danville, Pa. \$1,805,144. Metal parts for 90mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0205.
- G-Z Products, Rancho Cordova, Calif. \$1,659,590. Grommets for 175mm projectiles and eight-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0186.
- 14-John Wood Co., St. Paul, Minn. \$1,454,411. Fin assemblies for 500-lb bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0208.
- Talley Industries, Mesa, Ariz. \$3,909,427. M18 colored-smoke hand grenades. Edgewood Arsenal, Md. DA AA15-69-C-0170.
- Lockheed Aircraft Service Co., Luke Charles, La. \$1,811,000. Inspection and repair of UH-1D helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-D-0029.
- 15-David Band, Inc., New Orleans, La. \$2,043,956. 2,237,500 fiber ammunition containers for 105mm artillery shells. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0247.
- Paper Tubes, Inc., Buffalo, N.Y. \$2,062,751. 2,237,500 fiber ammunition containers for 105mm artillery shells. Army Procurement Agency, Chicago, Ill. DA AG11-79-C-0248.
- Consolidated Box Corp., Tampa, Fla. \$3,022,974. 3,356,250 fiber ammunition containers for 105mm artillery shells. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0249.
- Stone Container Corp., Chicago, Ill. \$1,030,481. 1,118,750 fiber ammunition containers for 105mm artillery shells. Army Procurement Agency, Chicago, Ill. DA AG11-69-C-0250.
- Norris Industries, Los Angeles, Calif. \$1,791,360. 90mm cartridge cases. Army Procurement Agency, Pasadena, Calif. DA AG07-69-C-0229.
- 16-Chamberlain Mfg. Corp., Elmhurst, Ill. \$5,894,899. Cartridge cases for 105mm projectiles. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0182.
- 17-Tepfer & Sons, Inc., Deer Park, N.Y. \$2,241,674. Fin assemblies for 750-lb bombs. Edgewood Arsenal, Md. DA AA15-69-C-0172.
- Kollman Instrument Corp., Elmhurst, N.Y. \$2,319,000. Metal parts for detonating fuzes. Melrose Park, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0222.
- American Fabricated Products Co., Indianapolis, Ind. \$1,189,000. Cartridge containers for obtaining assemblies for 4.2-inch mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0201.
- Bauer Ordnance Corp., Warren, Mich. \$1,091,400. Bayonet knives for M16 rifles. Army Weapons Command, Rock Island, Ill. DA AF01-69-C-0224.
- 18-Bell Aero-Systems, Tucson, Ariz. \$1,297,940. (contract modification). Study of electro-magnetic data collection. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0029.
- Brunswick Corp., Sugar Grove, Va. \$2,403,302. Green smoke hand grenades. Edgewood Arsenal, Md. DA AA15-69-C-0155.
- Fisher Chemical Corp., Englewood Cliffs, N.J. \$3,876,600. 810,000 lbs. of organic chemical. Great Meadows, N.J. Edgewood Arsenal, Md. DA AA15-69-C-0181.
- General Motors, Cleveland, Ohio. \$4,503,942 (contract modification). Engineering services for one year on the armored reconnaissance/airborne assault vehicle, M551. Army Weapons Command, Rock Island, Ill. DA 33-019-AMC-00248 (W).
- Chamberlain Mfg. Co., Elmhurst, Ill. \$3,044,122. Metal parts for 105mm smoke projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0489.
- 21-URS Corp., San Mateo, Calif. \$1,475,000 (contract modification). Advancement of design, development, programming and testing of Seventh Army (Combat Support) control center prototype software. Karlsruhe, West Germany and Falls Church, Va. DA 02-086-AMC-00539 (Y).
- Day & Zimmerman, Inc., Philadelphia, Pa. \$99,219,021. Load, assemble and pack miscellaneous selected ammunition items and components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00114 (A).
- Remington Arms, Inc., Bridgeport, Conn. \$82,887,410. Manufacture of small arms ammunition and for support services. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 49-610-AMC-00003 (A).
- Thiokol Chemical Corp., Bristol, Pa. \$74,044,046. Load, assemble and pack mortars, igniters, flares and related ammunition components. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-0-200 (A).
- Honeywell, Inc., Hopkins, Minn. \$2,265,000. Metal parts for artillery shell fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0191.
- R.D.K. Corp., Niles, Ill. \$2,384,278. Assembly of ammunition fiber containers. Albuquerque, N.M. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0220.
- 23-K.D.I. Precision Products, Inc., Cincinnati, Ohio. \$1,518,076. Metal parts for 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0196.
- Muncie Gear Works, Muncie, Ind. \$10,803,708. 2.75-inch rocket fin and nozzle assemblies. Muncie and Kokomo, Ind. Pictwinny Arsenal, Dover, N.J. DA AA21-69-C-0143.
- HITCO, Denver, Colo. \$10,584,000. 2.75-inch rocket fin and nozzle assemblies. Pictwinny Arsenal, Dover, N.J. DA AA21-69-C-0144.
- Hoffman Electronics Corp., El Monte, Calif. \$9,055,000. 2.75-inch rocket fin and nozzle assemblies. El Monte, Calif. and Kokomo, Ind. Pictwinny Arsenal, Dover, N.J. DA AA21-69-C-0146.
- Jackson Products Co., Tampa, Fla. \$7,176,000. 2.75-inch rocket fin and nozzle assemblies. Tampa, Fla. and Kokomo, Ind. Pictwinny Arsenal, Dover, N.J. DA AA21-69-C-0204.
- 24-Hughes Aircraft, Culver City, Calif. \$8,109,150 (contract modification). FY 1969 TOW weapon system engineering services. Army Missile Command, Huntsville, Ala. DA AH01-68-C-2155.

- Zeller Corp., Defiance, Ohio \$2,516,603. Metal parts for 20mm projectiles Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0181.
- Harvey Aluminum, Inc., Torrance, Calif. \$2,490,021 Metal parts for 20mm projectiles Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0183.
- Whittaker Corp., Sausalito, Calif. \$2,376,000. Load, assemble and pack 20mm ammunition fuzes Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0177.
- M. Steinthal & Co., New York, N.Y. \$1,918,142. Cargo parachutes, Roxboro, N.C. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0176.
- Switlik Parachute Co., Tinton, N.J. \$1,918,142. Cargo parachutes, Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0174.
- Miles Mfg. Corp., Asheville, N.C. \$1,918,142. Cargo parachutes Marshall and Asheville, N.C. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0175.
- 25 -Cul's Inc., Hattiford, Conn. \$8,189,327 (contract modification). 20-round magazine assemblies for the M-16 weapons family, \$3,813,512. Repair parts in support of the M-16 weapons family Army Weapons Command, Rock Island, Ill. DA AF03-69-C-0007. DA AF03-69-C-0030.
- Kilgore Corp., Toone, Tenn. \$1,935,360. 105mm shells Edgewood Arsenal, Md. DA AA15-69-C-0209.
- Chrysler Corp., Centerville, Mich. \$1,312,093. Advanced production engineering for the XM740 truck and XM747 semi-trailer. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2974.
- Drennan Construction Co., Albuquerque, N.M. \$1,170,700. Construction of a hospital addition and alterations at Sandia Base, N.M. Engineer Dist., Albuquerque, N.M. DA CA47-69-C-0030.
- Z.D. Products, Los Angeles, Calif. \$5,232,379. Metal parts for artillery fuse delay plungers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0197.
- Keystone Mfg. Co., Boston, Mass. \$3,815,606. Metal parts for artillery fuse delay plungers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0206.
- Chamberlain Mfg. Corp., Waterloo, Iowa. \$3,667,144. Metal parts for 2.75-inch rocket components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0231.
- National Union Electric Corp., Bloomington, Ill. \$1,116,000. bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0235.
- 28 -Norris Industries, Los Angeles, Calif. \$11,020,680. Motor tubes for 2.75-inch rocket motors. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0243.
- Aluminum Corp. of America, Pittsburgh, Pa. \$5,824,350. Motor tubes for 2.75-inch rocket motors New Kensington, Pa. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0236.
- 29 -Land-Air, Inc., Grand Prairie, Tex. \$2,072,000. Type G lifting plugs for 155mm and 175mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0239.
- Thiokol Chemical Corp., Woodbine, Ga. \$1,868,035. CS-2 riot control agent, \$8,437,673. CS-1 riot control agent Edgewood Arsenal, Md. DA AA15-69-C-0210. DA AA15-69-C-0182.
- Batesville Mfg. Co., Camden, Ark. \$3,120,603. 50-lb. cluster canisters. Edgewood Arsenal, Md. DA AA15-69-C-0213.
- Hercules Engine, Inc., Canton, Ohio \$2,329,179. Ten and 20-horsepower standard engines. Army Mobility Equipment Command, St. Louis, Mo. DA 23-195-AMC-00284 (T).
- K D I Precision Products, Inc., Cincinnati, Ohio. \$1,537,910. Safety and arming devices for M429 fuzes. Army Procurement Agency, Cincinnati, Ohio DA AA09-69-C-0220.
- 30 -Hercules Engines, Inc., Canton, Ohio \$3,274,788 (contract modification). LD-465-1 engine assemblies for 2 1/2-ton trucks. Tank Automotive Command, Warren, Mich. DA AE06-58-C-0006.
- Martin Marietta Corp., Orlando, Fla. \$16,680,304. 1,078,296 man hours of industrial engineering services for the Pershing weapons system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0616.
- Ametek, Inc., Sheboygan, Wis. \$1,470,800. Stabilizer rods for 2.75-inch rockets. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0211.
- Sargent Bros., Division of Parker-Hannifin Corp., Tulsa, Okla. \$1,097,434. Damper assemblies for UH-1 helicopters. Aviation Materiel Command, St. Louis, Mo. DA 23-240-AMC-03669.
- General Dynamics, Pomona, Calif. \$2,071,233. FY 1969 Redeye engineering services. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0683.
- AYCO Corp., Stratford, Conn. \$1,009,515. T53-L-701 engines for Mohawk aircraft. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1874.
- Supreme Products Corp., Chicago, Ill. \$1,877,720. Metal parts for 20mm fuzes. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0164.
- Galton Amco, Inc., Galton, Ohio. \$2,159,700. Metal parts for 20mm fuzes. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0165.
- Z.D. Products, El Segundo, Calif. \$1,222,262. 20mm projectiles Costa Mesa, Calif. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0194.
- Harvey Aluminum, Inc., Torrance, Calif. \$1,116,788. 20mm projectiles, Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0195.
- Lockheed Electronics Co., Plainfield, N.J. \$1,295,000. Radar sets and installation kits used in 20mm AAA gun fire control systems. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0196.
- Federal Cartridge Corp., Minneapolis, Minn. \$95,145,563 (contract modification). Production of small arms ammunition and support services at the Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 36-038-AMC-01099 (A).
- Phestone Tire & Rubber Co., Akron, Ohio \$11,617,036 (contract modification). Loading, assembling and packing of ammunition items and support services at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00065 (A).
- Harvey Aluminum Sales, Inc., Torrance, Calif. \$73,725,632 (contract modification). Loading, assembling and packing of medium caliber ammunition and components, and for maintenance and support services at the Army Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00520 (A).
- Hercules, Inc., Wilmington, Del. \$47,767,126 (contract modification). Production of propellants and explosives and for support services at the Army Ammunition Plant, Radford, Va.; \$9,599,266 (contract modification). Modification for production of rocket propellant and support services at the Sunflower Army Ammunition Plant, Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00037 (A). DA 11-173-AMC-00042 (A).
- Holston Defense Corp., Kingsport, Tenn. \$25,126,269 (contract modification). Production of explosives and support services at the Holston Army Ammunition Plant, Kingsport, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00035 (A).
- Mason & Hauger-Silas Mason Co., Inc., New York, N.Y. \$51,993,761 (contract modification). Loading, assembling and packing of medium and large caliber ammunition items and components; and for support services at the Army Ammunition Plant, Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0468.
- Olin Mathieson Chemical Corp., New York, N.Y. \$48,885,552 (contract modification). Production of propellants, bags and related ammunition components; \$12,956,416 (contract modification). Production of various propellants and for support services at the Badger Army Ammunition Plant, Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00007 (A). DA AA09-69-C-0014.
- Sperry Rand Corp., New York, N.Y. \$98,477,031 (contract modification). Production of major caliber ammunition items and components. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.
- Uamoyal, Inc., New York, N.Y. \$126,842,519 (contract modification). Manufacture of various explosives, packing, loading, and assembling of 105mm and 8-inch projectiles, and for support services at the Army Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00062 (A).
- Chamberlain Mfg. Corp., New Bedford, Mass. \$12,252,000. Metal parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0238.
- Model Screw Products, Inc., Hazelwood, Mo. \$1,168,500. Cartridge containers for obtaining assemblies for 4.2-inch mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0240.
- Bulova Watch Co., Flushing, N.Y. \$5,518,276. MT M565 fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0242.
- 31 -Green Construction Co., Des Moines, Iowa. \$19,499,570. Construction work at the Raystown Reservoir Project Huntington County, Pa. Engineer Dist., Baltimore, Md. DA CW31-69-C-0013.
- Martin Marietta Corp., Orlando, Fla. \$3,754,117. Modification kits for Pershing Weapons System ground equipment. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0663.
- General Motors, Indianapolis, Ind. \$1,392,390. Transmission assemblies. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0535.
- Ford Motors, Dearborn, Mich. \$1,893,550 (contract modification). Engineering support to produce five-ton trucks. Warren, Mich. Tank Automotive Command, Warren, Mich. DA AE07-68-C-0445.
- Philco-Ford Corp., Newport Beach, Calif. \$5,425,000. Shilleagh engineering services. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0684.
- Sylvania Electric Products, Inc., Mountain View, Calif. \$1,939,000. Research and development in electronic warfare. Electronics Command, Fort Monmouth, N.J. DA AB07-68-A-0503.
- Hughes Aircraft, Fullerton, Calif. \$4,691,463 (contract modification). Radio sets. Army Procurement Agency, Pasadena, Calif. DA AB05-68-C-0008.
- General Electric, Syracuse, N.Y. \$5,217,000. Anti-jam improvement kits for the Hercules weapons system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0287.
- Techfab Div. of ALSCO, Inc., St. Louis Mo. \$1,510,687. XM-150C airborne rocket launchers. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0729.
- Raytheon Co., Andover, Mass. \$1,123,429. Product insurance and engineering services for the self-propelled Hawk missile system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0657.
- Minnesota Mining and Mfg. Co., Camarillo, Calif. \$1,000,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.
- General Electric, Burlington, Vt. \$10,773,720. 20mm air defense artillery guns. Army Procurement Agency, New York, N.Y. DA AG25-69-C-0408.
- Chamberlain Mfg. Corp., Elmhurst, Ill. \$13,443,600. Metal parts for 155mm projectiles. Seranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0225.
- U.S. Steel, Pittsburgh, Pa. \$11,875,000. Metal parts for eight-inch projectiles. Reaick, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0226.
- L. E. Mason Co., Hyde Park, Mass. \$1,679,368. Metal parts for M126 nose body assemblies for M36 bomb clusters. Edgewood Arsenal, Md. DA AA15-69-C-0169.
- Amron Corp., Waukesha, Wis. \$2,030,930. Brass cartridge cases for 20mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0202.
- Bell Helicopter Co., Fort Worth, Tex. \$7,161,671. UH-1H helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0566.
- Hughes Aircraft, Culver City, Calif. \$1,719,262 (contract modification). Missile guidance sets for TOV weapons system. El Segundo, Calif. Army Missile Command, Huntsville, Ala. DA AH01-69-A-0002.
- J. R. Hollingsworth Co., Phoenixville, Pa. \$4,513,938. \$3,606,173. Generator sets. Mobility Equipment Command, Warren.

Mich DA AK01-68-C-1573 DA AK01-68-C-1572
 -General Motors, Ypsilanti, Mich \$18,720.-
 000. M16A1 rifles Army Weapons Command, Rock Island, Ill DA AF03-68-C-0048.
 -Harrington & Richardson, Inc., Worcester, Mass. \$13,254,300 M16A1 rifles Army Weapons Command, Rock Island, Ill. DA AF03-68-C-0045



DEPARTMENT OF THE NAVY

- 1-Stanwick Corp., Washington, D.C. \$1,912.-465. Development and analysis of management information products for various naval commands, Arlington, Va. Naval Ship Systems Command. N00021-69-C-5021.
- Horne Bros., Inc., Newport News, Va \$1,095,095. Regular overhaul of the landing ship tank USS Suffolk County (LST-1173) Supervisor of Shipbuilding, Construction and Repair, Fifth Naval Dist., Newport News, Va. N02873-67-C-0013.
- 2-Grumman Aircraft Engineering Corp., Bethpage, N.Y. \$5,755,000 (contract modification). Incremental funding for E-2C aircraft. Naval Air Systems Command. N00019-68-C-0542.
- Raytheon Co., Lowell, Mass. \$3,703,788 Guidance and control groups for Sidewinder IC missiles. Naval Air Systems Command. N00019-69-C-0056.
- Pyrotec Inc., Hingham, Mass. \$1,857,147. Fire suppression equipment and spare parts. Naval Ship Systems Command. N00024-69-C-5138.
- 3-North American Rockwell Corp., Columbus, Ohio. \$1,757,000 (contract modification). FY 1969 procurement of RA-5C aircraft. Naval Air Systems Command. N00019-68-C-0190.
- American Mfg. Co., Fort Worth, Tex \$13,086,920 MK 52, MOD 0, five-inch 38-cal. projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0098.
- FMC Corp., San Jose, Calif \$2,000,000 Design, development and construction of two assault amphibious vehicles. Naval Ship Systems Command. N00024-69-C-0227.
- United Aircraft, Windsor Locks, Conn \$2,173,330 (contract modification). Propeller systems for P-3C aircraft. Naval Air Systems Command. N00019-68-C-0543.
- Laudonville Steel & Iron Co., Morton, Pa. \$1,028,000. MK 52, MOD 0, five-inch, 38-cal. projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0095.
- Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md \$1,877,772 Work on the Bumblebee project. Naval Ordnance Systems Command. N00-62-0604C.
- TYCO Labs, Inc., Fairfield, N.J. \$1,852,200. MK 29, MOD 3, fuzes. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0076.
- RCA, Moorestown, N.J. \$1,325,841. An instrumentation radar system. Navy Purchasing Office, Los Angeles, Calif. N00123-69-C-0493.
- Futronics Corp., Port Washington, N.Y. \$2,388,000. Electronic shops for the Fleet Marine Forces Headquarters, Marine Corps. M00027-69-C-0045.
- 4-Beech Aircraft, Wichita, Kan. \$4,298,999. AQM-37A targets. Naval Air Systems Command. N00019-69-C-0174.
- M-R-S Mfg. Co., Flora, Miss. \$1,253,830. Tractors. Headquarters, Marine Corp. M00027-69-C-0049.
- 7-Texas Instruments, Dallas, Tex \$9,576,763. Strike missile guidance and control sections. Naval Air Systems Command. N00019-69-C-0116.
- Lasko Metal Products, Westchester, Pa. \$4,777,170. LAV-10A rocket launchers. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0102.
- 8-Little, Inc., Cambridge, Mass \$1,200,333. Research and development study of testing and implementation of computer aided ship cutting machinery. Naval Ship Systems Command. N00024-69-C-0233.
- 9-North American Rockwell Corp., Anaheim, Calif \$8,825,000 (contract modification) Bomb navigational systems components for use on various aircraft. Aviation Supply Office, Philadelphia, Pa. N0038-67-Z-5502-0279 MOD-AB.
- Westinghouse Electric, Baltimore, Md \$2,050,000. Production of torpedo targets, for use in evaluating the MK 48 torpedo weapons system. Naval Ordnance Systems Command. N00017-68-C-1222.
- Cosmodyne Mfg. Co., Louisville, Ky. \$1,663,200. Missile cradles used for storing, shipping and transferring Rockeye II cluster bombs from tidewater depots to combat ships and/or ammunition ships to service Navy Purchasing Office, Los Angeles, Calif. N00123-69-C-0600.
- McDonnell-Douglas Corp., Long Beach, Calif. \$1,434,300 Cap assembly bitches for various aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-3200-0338.
- 10-United Aircraft, Stamford, Conn \$7,000,000 (contract modification). Long lead time effort and materials for CH-53C helicopters. Naval Air Systems Command. N00019-67-C-0101.
- Raytheon Co., Sudbury, Mass. \$5,273,218. Poseidon guidance system design effort. Strategic Systems Project Office. N00030-68-C-0159.
- McDonnell Douglas Corp., St. Louis, Mo. \$2,400,000 (contract modification). Long lead time effort and materials to support FY 1969 procurement of P-1E aircraft. Naval Air Systems Command. N00019-68-C-0495.
- Industrial Contractors, Idaho Falls, Idaho \$1,487,000. Construction of a power plant at the Satellite Test Annex, Sunnyvale, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. N02474-68-B-0250.
- Boeing Co., Seattle, Wash. \$6,000,000. Contract definition phase of the Advanced Surface Missile System program. Naval Ordnance Systems Command. N00017-69-C-2101.
- General Dynamics, Pomona, Calif. \$4,000,000. Contract definition phase of the Advanced Surface Missile System program. Naval Ordnance Systems Command. N00017-69-C-2402.
- RCA, Moorestown, N.J. \$4,000,000. Contract definition phase of the Advanced Surface Missile System program. Naval Ordnance Systems Command. N00017-69-C-2403.
- 11-General Electric, Schenectady, N.Y. \$17,000,000. Nuclear reactor components. Naval Ship Systems Command. N00024-67-C-5056.
- Western Electric, New York, N.Y. \$11,873,316. Oceanographic research ship equipment. Wilson-Salem and Burlingame N C Naval Electronic Systems Command. N00019-C-3508. N00039-69-C-3514.
- Waltham Precision Instrument, Inc., Waltham, Mass. \$1,010,011. Demolition fuzing devices. Naval Ammunition Depot, Crane, Ind. N00164-69-C-0195.
- 15-General Electric, Schenectady, N.Y. \$15,000,000. Nuclear reactor compartment components. Naval Ship Systems Command. N00024-69-C-5154.
- General Electric, Washington, D.C. \$4,793,000. Operation support services for Polaris fire control systems and related support equipment. Pittsfield, Mass. \$15,000,000. Poseidon fire control and support equipment (phase IIIB). Pittsfield Mass. Strategic Systems Project Office. N00030-69-C-0074. N00030-69-C-0125.
- Westinghouse Electric, Washington, D.C. \$13,035,000. Poseidon launcher systems, Sunnyvale, Calif. Strategic Systems Project Office. N00030-69-C-0134.
- Gould National Batteries, St. Paul, Minn. \$3,728,002. Submarine batteries. Kiska, Ill. and Trumbull, N.J. Naval Ship Systems Command. N00024-69-C-0187.
- Philco-Ford Corp., Fort Washington, Pa. \$1,278,351. Engineering services involving installation, testing, checkout, adjustment and on-the-job maintenance training for various electronic equipment. Naval Ship Systems Command. N00024-69-C-1015.
- General Dynamics, Groton, Conn. \$1,000,000. Engineering and planning shipyard services to support alteration, maintenance and repair of operational submarines. Naval Ship Systems Command. N00024-69-C-0230.
- 16-Columbia University, New York, N.Y. \$2,000,000. Research in underwater sound and related subjects. Office of Naval Research.
- General Atronics Corp., Philadelphia, Pa. \$1,515,399. Manufacture of (scillio)scop., and accessories. Naval Electronic Systems Command. N00030-69-C-2507.
- M.I.T., Cambridge, Mass. \$1,500,000. Design and development of an advance guidance system for Poseidon Strategic Systems Project Office. N00030-69-C-0089.
- 17-American Machine & Foundry Co., York, Pa. \$41,959,484. MK 82, MOD 1, 500-lb bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0117.
- Maxson Electronics Corp., Macon, Ga. \$4,224,000. MK 31, MOD 2, bus detonating fuzes. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0079.
- Western Molded Fibre Products, Gardena, Calif. \$1,305,000. Rocket launcher fairings for Zumwalt Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0089.
- United Aircraft, Hartford, Conn. \$1,780,628. Spare parts for J52 and TF-30 aircraft engines. Aviation Supply Office, Philadelphia, Pa. N00383-69-000A-AF818.
- General Dynamics, Groton, Conn. \$1,000,000. Engineering and planning shipyard services to conduct hull planning yard functions and related work. Naval Ship Systems Command. N00024-69-C-0240.
- 18-North American Rockwell Corp., Anaheim, Calif. \$6,147,116. Modification of Government-furnished ships. Inertial navigation systems equipment. Naval Ship Systems Command. N00024-69-C-5007.
- General Electric, Schenectady, N.Y. \$1,683,000. Design and furnish nuclear propulsion components. Navy Ships Systems Command. N00024-67-C-5014.
- 21-Honeywell, Inc., Minneapolis, Minn. \$15,473,236. Rockeye II components. Naval Air Systems Command. N00019-69-C-0163.
- 22-American Cement Corp., Los Angeles, Calif. \$2,025,324. Cement. Orr, Granite, Calif. Navy Purchasing Office, Los Angeles, Calif. N00123-69-D-0432.
- United Aircraft, East Hartford, Conn. \$1,746,268. TF30 engine spare parts for A7A and A7B aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-69-C-000A AF835.
- Simplex Wire & Cable Co., Newington, N.H. \$1,500,000. Manufacture of oceanographic equipment. Naval Electronic Systems Command. N00039-69-C-3513.
- Willamette Iron & Steel Co., Portland, Ore. \$1,385,500. Regular overhaul of the landing ship dock USS Comstock (LSD-19). Supervisor of Shipbuilding, Conversion and Repair 13th Naval Dist., Seattle, Wash. N02709-69-B-0003.
- Honeywell, Inc., Minneapolis, Minn. \$3,392,850. Rockeye II components. Hopkins, Minn. Naval Air Systems Command. N00019-68-C-0315.
- North American Rockwell Corp., Columbus, Ohio \$2,520,000. Design, development, fabrication and testing of a naval intelligence processing system. Naval Air Systems Command. N00019-68-C-0525.
- Bunker-Ramo Corp., Silver Spring, Md. \$1,101,000. Work on ECM equipment. Naval Air Systems Command. N00019-68-C-0210.
- United Steel Corp., Pittsburgh, Pa. \$25,019,168. 500-lb. bomb bodies. McKeesport, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3509 MOD P011.
- Conco, Inc., Mendota, Ill. \$1,763,068. MK 77, MOD 2, bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0127.
- Intercontinental Mfg. Co., Garland, Tex. \$13,383,668. 500-lb bomb bodies. \$6,227,155. 2000-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0120. N00104-69-C-0115.
- 23-George G. Sharp, Inc., New York, N.Y. \$1,117,774. Preparation of the basic ship systems design for a nuclear guided missile frigate. Naval Ship Systems Command. N00024-69-C-5203.
- 24-Hazeltine Corp., Little Neck, N.Y. \$1,094,004. Sonar transducers for naval ships. Braintree, Mass. Naval Ship Systems Command. N00024-69-C-1084.

—General Thine Corp., Skokie, Ill. \$1,514,621. Mechanical time fuses, plus shipping and storage containers. Naval Air Systems Command N00019-69-C-0151.

—Western Molded Fiber Products, Gardena, Calif. \$1,514,629. Cork plugs, Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0091.

—Whittaker Corp., Saugus, Calif. \$2,721,100. Electric primers for 5-inch, 54-cal projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00101-69-C-0124.

—Maxon Electronics Corp., Macon, Ga. \$1,799,600. \$1,745,280. Electric primer for 5-inch, 54-cal. projectile. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0115. N00104-69-C-0123.

25—General Electric, Pittsfield, Mass. \$2,716,310. Production of gun and guided missile directors for the Tartar weapon system and for related equipment for the navies of certain member nations of NATO. Naval Ordnance Systems Command N00017-69-C-2302.

—General Precision Systems, Glendale, Calif. \$2,382,607. Production of fire control system MK 113, MOD 9. Naval Ordnance Systems Command N00017-69-C-1410.

—General Instrument Corp., Hicksville, N.Y. \$1,990,994. Portable radar units. Naval Electronic Systems Command, N00039-68-C-0540.

—K.E. Black, Ltd. Honolulu, Hawaii. \$1,363,400. Construction of barracks at Camp Smith, Oahu, Hawaii. Pacific Div., Naval Facilities Engineering Command, Pearl Harbor, Hawaii. N62471-69-B-0293.

—Fairchild Camera & Instrument Corp., Syosset, N.Y. \$1,041,000 (contract modification). Fuses for 5-inch, 38-cal ammunition. Copleague, N.Y. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0702.

—General Electric, Schenectady, N.Y. \$1,000,000. Nuclear propulsion research and development. Naval Ship Systems Command, N00024-67-C-5016.

28—LTV Aerospace Corp., Dallas, Tex. \$31,000,000 (contract modification). Long lead time effort for FY 1969 procurement of A-7E aircraft. Naval Air Systems Command, N00019-68-C-0076.

—General Electric, Washington, D.C. \$21,036,424. Poseidon fire control and support equipment. Pittsfield, Mass. Strategic Systems Project Office, N00030-68-C-0161.

—General Electric, Cincinnati, Ohio. \$4,842,400. \$1,801,938. Spare engine parts for RA-5C, F-4B and F-4I aircraft. Aviation Supply Office, Philadelphia, Pa. F34601-68-D-2525-GB34 and F34601-68-D-2526-GB36.

—Gibbs Mfg. & Research Corp., Jonesville, Wis. \$3,338,808. MK 84, MOD 0, bomb fuses for MK 80 series bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-C-0111.

—Tasker Industries, Van Nuys, Calif. \$1,160,816. Design, development and fabrication of radar systems and associated radar control equipment. Naval Air Systems Command, N00019-69-C-0181.

—Honeywell, Inc., St. Petersburg, Fla. \$1,084,600. Repair of Polar's integrated integrated gyro assemblies for FY 1969. Strategic Systems Project Office, N00030-69-C-0076.

—Columbia University, New York, N.Y. \$1,200,000. Research in underwater acoustics. Office of Naval Research.

29—Firestone Tire & Rubber Co., Akron, Ohio. \$1,035,000. Inflatable life boats. Magnolia, Ark. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-69-D-0169.

30—James A. Mann, Inc., Philadelphia, Pa. \$1,454,009. Construction work in two buildings at the Defense Personnel Support Center, Philadelphia, Pa. Naval Facilities Engineering Command, N62472-67-C-0301.

—James E. Cox Construction, Inc., Charlotte, N.C. \$1,720,883. Construction of an explosive engineering development facility at the Naval Weapons Station, Yorktown, Va. Naval Facilities Engineering Command, N62470-68-C-0534.

—Norge Associates, Inc., Sea Cliff, N.J. \$1,480,180. Construction of a Detection, Intercept—Passive Submarine (DIPS) training building at the Naval Submarine School, New London, Conn. Naval Facilities Engineering Command, N62310-68-C-0044.

—Trendwell Corp., New York, N.Y. \$1,044,000. Overhaul and repair of submarine

oxygen generators. Naval Ship Systems Command N00024-69-C-5189.

31—Westinghouse Electric, Baltimore, Md. \$3,590,888. Spare parts in support of AN/APG59 radar sets for F-4J aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-69-A-4900-0020.

—Curtiss Wright Corp., Wood-Ridge, N.J. \$2,753,145. Spare parts to support J65 engines for A-4 aircraft. Aviation Supply Office, Philadelphia, Pa. F41608-67-A-5900.

—Sperry Rand Corp., Syosset, N.Y. \$1,767,249. Technical planning assistance in the inertial navigation sub-systems of the Poseidon missile conversion program. Naval Ship Systems Command N00024-69-C-5191.

—Standard Products Co., Cleveland, Ohio. \$1,098,900. 2,220 truck section repair kits. Port Clinton, Ohio Headquarters, Marine Corps. N00150-69-C-0109.



DEPARTMENT OF THE AIR FORCE

1—ITT Corp., Nutley, N.J. \$1,963,000. Production of telephone communications equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-C-0248.

2—General Electric, West Lynn, Mass. \$3,800,000 (contract modification). Engineering-development work on the T-8 aircraft engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0730 P001.

3—Hughes Aircraft, Culver City, Calif. \$3,250,000. Production of modification kits for Falcon missiles. Tucson, Ariz. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0911.

—LTV ElectroSystems, Inc., Greenville, Tex. \$1,526,216. \$5,816,914. Maintenance, repair and modification of C-130 and C-133 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0660. F09603-69-C-0137.

—Fairchild Hiller Corp., St. Augustine, Fla. \$3,503,880. Maintenance, repair and modification of C-130 aircraft. St. Petersburg, Fla. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0873.

—American Airmotive Corp., Miami, Fla. \$1,828,688. Maintenance, repair and modification of B-57 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0978.

—Electronic Communications, Inc., St. Petersburg, Fla. \$1,827,574. Production of components for AN/ARC-89 (V) communications systems. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0811.

—General Electric, Ontario, Calif. \$3,107,310. Overhaul of hydraulic components for B-52 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34(601)-69-D-0352.

4—Hallcrafters Co., Rolling Meadows, Ill. \$1,127,165 (increment to an existing contract). Production of electronic tubes. Chicago, Ill. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-68-C-0328.

—Hallcrafters Co., Rolling Meadows, Ill. \$1,112,600 (increment to an existing contract). Modification of airborne countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0582.

—Curtiss-Wright Corp., Wood-Ridge, N.J. \$3,640,672. Overhaul of J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-69-D-0290.

—Bendix Corp., Teterboro, N.J. \$1,100,000. Airborne navigational computer systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0819.

—Texas Instruments, Dallas, Tex. \$1,000,000. Production of airborne radar for RF-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0251.

—General Electric, Cincinnati, Ohio. \$1,000,000. Development of an advanced turbine-engine gas generator. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF3/657/16195.

—Thiokol Chemical Corp., Bristol, Pa. \$5,117,616. Preproduction qualification of Stage III Minuteman motors. Bingham City, Utah. Space & Missile Systems Organization, (AFLC), Los Angeles, Calif. FO1701-68-C-0175.

7—System Development Corp., Santa Monica, Calif. \$1,000,000. Computer program integration. Air Force Satellite Control Facility, Los Angeles, Calif. FO4701-69-C-0011.

8—General Electric, West Lynn, Mass. \$4,730,000. Production of engines for T-2C aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0065.

—Hayes International Corp., Dothan, Ala. \$2,807,196. Inspection, repair and maintenance of C-118 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-0758.

—Curtiss Wright Corp., Caldwell, N.J. \$1,400,438. Overhaul of propeller assemblies applicable to C-124 and C-133 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-D-0090.

—Aero Corp., Lake City, Fla. \$1,262,100. Inspection, repair and maintenance of C-121 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. FO4606-69-C-0060.

9—Fairchild Hiller Corp., Farmingdale, N.Y. \$2,000,000. Modification of F-105 flight control and navigation systems. \$2,100,000. Modification and flight testing of the F-105 weapons delivery system. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. FO4606-68-C-1056. FO1606-68-C-1056.

10—United Aircraft, East Hartford, Conn. \$1,662,060. Production of spare parts for J57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383-69-000A.

11—Dynamics Corp. of America, Bridgeport, Conn. \$1,624,952. \$4,360,724. Production of generator sets. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. FO1606-68-D-0575-0006. FO4606-07-D-70321-0003.

—General Motors, Indianapolis, Ind. \$7,661,206. Production of modification kits for T-56 jet engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-A-0532-0128.

—United Aircraft, Stratford, Conn. \$3,518,572. Production of components for HH-53 helicopters. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-A-0029-0046.

14—General Electric, Utica, N.Y. \$1,351,000. Spare parts and components for airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0367.

—AVCO Corp., Stratford, Conn. \$3,178,190. Work on the MK 11-A reentry vehicle. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04-694-971.

15—General Motors, Indianapolis, Ind. \$1,416,270. Production of compressor blades applicable to T56 aircraft engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F4601-68-D-0622-0007.

—Hughes Aircraft, Culver City, Calif. \$3,030,500. Production of components and spare parts for airborne electronic systems. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. FO4606-68-A-0225.

—ITT Research Institute, Chicago, Ill. \$4,500,000. Operation of an electromagnetic compatibility analysis center. Annapolis, Md. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628-69-C-0073.

—Whittaker Corp., Columbus, Ohio. \$19,089,911. Production of bomb components. Armament Development Test Center, Eglin AFB, Fla. F08635-69-C-0016.

—McDonnell Douglas Corp., Santa Monica, Calif. \$4,621,460. Launch support services at Vandenberg AFB, Calif., from Oct. 1, 1968, to March 31, 1970, for various space programs. Space & Missile Systems Or-

- ganization, (AFSC), Los Angeles, Calif F04701-68-C-0249
- 16—Mitic Corp., Bedford, Mass. \$9,630,750 Research and development for system design, system engineering, intersystem integration, and research and experimentation to achieve continuing advances in the field of information and communication systems. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628-68-C-0365
- Aerodex Inc., Miami, Fla. \$4,071,714. Overhaul and modification of T-56 aircraft engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-0098
- Technicolor, Inc., Hollywood, Calif \$2,923,873. Photo optical instrumentation and related support services. Patrick AFB, Fla Procurement Div., Patrick AFB, Fla
- 17—Ryan Aeronautical Co., San Diego, Calif \$5,830,240. Aerial target drones. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
- Sperry Rand Corp., Salt Lake City, Utah \$3,073,875. Development and fabrication of a data relay system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-68-C-0910-P007
- 18—General Electric, Cincinnati, Ohio \$11,710,200. Production of J79 turbojet engines in support of the F-4E aircraft. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F03657-68-C-1232
- Boeing Co., Wichita, Kan. \$3,600,000 Engineering services for the FY 1969 B-52 fleet support program. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla F34601-68-C-4560
- Cutler-Hammer, Inc., Dear Park, N.Y. \$2,657,228 Production of airborne radio equipment. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F34601-68-A-3106
- 21—American Electric, Inc., La Mirada, Calif \$25,854,760. Production of 750 lb bombs. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah, F12600-69-C-2205
- Northrop Corp., Hawthorne, Calif \$3,700,000 T-38 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-69-C-0150
- M.I.T., Cambridge, Mass \$2,006,000. Advanced development of a re-entry guidance system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif F04701-69-C-0123
- 22—General Electric, Cincinnati, Ohio \$41,847,767 (final increment to a previously awarded contract). Production of J79 engines in support of the F-4J aircraft program. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-68-C-0632
- Hughes Aircraft, Culver City, Calif. \$1,200,000. Development of advanced fire control/missile technology. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio, F33615-69-C-1108
- United Aircraft of Canada, Ltd., Longueuil, Quebec, Canada \$1,398,831 Spare parts applicable to R-4360 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex
- 23—American Electric, La Mirada, Calif \$1,385,047 Production of aircraft ordnance. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah F12600-69-C-2216
- United Aircraft, East Hartford, Conn \$1,459,656 Production of spare parts for TF33 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex N383-69-C-000A SA-69-459
- United Aircraft, East Hartford, Conn \$1,412,736. Production of spare parts for J57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex N383-69-C-000A SA-69-122
- United Aircraft, East Hartford, Conn \$1,000,000. Development work on an advanced turbine engine gas generator. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0362
- 25—McDonnell Douglas Corp., St. Louis, Mo \$5,000,000. Re-entry vehicle developmental flight tests. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif F04701-68-C-0034
- Boeing Co., Seattle, Wash. \$1,447,064 Production of Minuteman missiles and related equipment. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif AF01 (694)-896
- 28—Fairchild Camera & Instrument Corp., Syosset, N.Y. \$1,825,095 (contract modification). Production of aircraft cameras. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0896-P002
- 29—Bendix Corp., Teaneck, N.Y. \$1,613,110 (contract modification). Production of aircraft instruments. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-67-C-0844-P003
- Texas Instruments, Inc., Dallas, Tex. \$1,517,027 (contract modification). Manufacture of components of electronic equipment for F-4C aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-68-C-0379-P005
- 30—Lockheed Aircraft, Marietta, Ga \$16,019,682. C-130H aircraft, data, spare parts, aerospace ground equipment, and spare parts for aerospace ground equipment for MAP. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio F33657-69-C-0212
- 31—Philco Ford Corp., Philadelphia, Pa. \$1,608,880. Production of communications modification kits. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-A-2705

Gravity Measurement Accuracy Improved by New Instrument

A new gravity measuring apparatus—the most precise instrument of its type ever developed—has been installed at the Air Force Cambridge Research Laboratories (AFCRL), Bedford, Mass.

Based on the principle of clocking the rate of speed of a falling object, the new instrument was developed for AFCRL and the National Bureau of Standards by James E. Faller of Wesleyan University.

The apparatus, which has a vertical length of 10 feet, is essentially a Michelson-type interferometer with a helium-neon light source. The heart of the system is an evacuated four-foot drop chamber. Associated with the apparatus is an array of electronic timing gear.

At AFCRL, the apparatus will be placed on a concrete seismic pier built on bedrock. Part of the apparatus itself is a seismometer for sensing and correcting vibrations.

Initial measurements with the instrument suggest that it is capable of precisions approaching one part in a hundred million. With this degree of accuracy, the new laser-interferometer apparatus will be able to measure the minute (several parts in 10 million) tidal variations caused by the attraction of the sun and the moon with greater precision than any previous absolute gravity instrument.

After the gravity values for the Cambridge site have been measured and averaged, the AFCRL installation will serve as a standard to which other gravity instruments can be brought for calibration.

The laser-interferometer apparatus will remain in place at AFCRL only until the gravity value at the site has been established. It will then be transported to other locations by AFCRL for similar measurements.

The AFCRL gravity measuring program, which includes both the development of new gravity instruments and the use of the instruments to measure gravity values at various locations, is under the direction of Bela Szabo.

ARISTOTLE Symposium Proceedings Published

The National Security Industrial Association (NSIA) has published a 642-page illustrated manual which describes the results of the first ARISTOTLE Symposium, held Dec. 6-7, 1967, in Washington, D.C.

Project ARISTOTLE (acronym for Annual Review and Information Symposium on the Technology of Training, Learning and Education) was established to provide a structure to encourage continuing communication and exchange of accomplishments within the government/industry/education communities.

Topics covered in the manual include:

- Systems Approach to Education.

- Government / Education / Industry Interface.
- Information Storage, Retrieval and Dissemination.
- Educational Research.
- Standards, Measurements and Evaluation.
- Courses, Tasks and Skills.
- International Considerations.

Copies of "Proceedings of Project ARISTOTLE Symposium" can be ordered, at a cost of \$11 per copy, from the following address:

National Security Industrial Association
Publications Dept.
Suite 800
1030 15th St., N.W.
Washington, D.C. 20005

Bulletin Conducts Annual Readership Survey

Each year the Joint Congressional Committee on Printing requires the *Defense Industry Bulletin* to verify its subscriber list. A survey card has been mailed to each addressee. Every reader who wishes to receive the *Bulletin* for another year must return the survey card appropriately marked by January 1, 1969. New subscribers, whose issues began with the November *Bulletin*, will continue to receive the magazine throughout 1969, and will not receive a survey card.

An old subscriber who has not received his survey card already may use the top of this page to renew his subscription. Fill in the appropriate spaces to the right, cut off the top portion of this page, and send it to the Editor, Defense Industry Bulletin, OASD(PA), Pentagon, Washington, D.C. 20301. Be sure to clip the entire top portion of this page so that your mailing label appears on the reverse side of this form.

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Chemical Field Alarm System Nears Completion

The Army has achieved a breakthrough in chemical warfare defense with a new chemical field alarm system nearing completion of development by scientists and engineers at Edgewood Arsenal, Md.

The new portable chemical agent alarm (XM8) will provide U.S. field forces, for the first time, with automatic means of detection and warning of the presence of nerve agents.

Effective detection devices have been available previously but lacked automatic alarm capabilities suitable for use by field troops.

Need for an adequate detection and alarm system is essential because the various nerve agents are odorless and colorless, and very small doses are lethal.

The heart of the XM8 is an electrochemical cell which samples air continuously. The presence of nerve agents causes the cell to produce electric energy which triggers the alarm.

The complete system consists of six components—a detector unit, a remote alarm, a power source, detector refill kit, field test kit and vehicle mounting kit.

Special consideration was given to the design of the alarm system to

make it as rugged, compact and lightweight as possible. The end product measures about 26 inches high, 12 inches wide and 8 inches deep. Complete with its battery power-pack which can operate the detector and alarm for a minimum of 12 hours, it weighs less than 18 pounds.

Light enough to be carried by an individual soldier, the alarm can also be vehicle mounted or used in fixed emplacements.

Designed for use in a wide variety of tactical and environmental situations, the alarm has successfully been tested at temperatures ranging from -40 degrees to +120 degrees Fahrenheit.

The new alarm is extremely sensitive and will detect minute amounts of nerve agent vapor in below-lethal concentrations.

The research and development team at Edgewood Arsenal was headed by John C. Young, a supervisory chemist, who heads the Alarms Branch in the arsenal's Warning and Detection Laboratory.

The Bendix Corp., Towson, Md., was the principal contractor, with major contributions being made by the Southern Research Institute of Birmingham, Ala.

Navy Expands SEALAB Aquanaut Teams

The U.S. Navy has increased the size of its SEALAB III capsule crews to include four more aquanauts.

Addition of the four divers, three Navymen and one civilian, brings the total number of aquanauts who will occupy the undersea research capsule to 44.

Four of the five aquanaut teams, which will spend 12-day periods working in the underwater habitat located off the coast of Southern California at a depth of 600 feet, will be increased from eight to nine members.

Size of the habitat teams was increased to expedite completion of the ambitious SEALAB III scientific program by improving the work and rest schedules.

The four additional occupants of the capsule were drawn from the existing group of qualified aquanauts. Other qualified divers will serve as surface support members of the experiment and will be on call if replacements are needed.

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DOD Supports Space Missions

Project Apollo, of the National Aeronautics and Space Administration (NASA), will culminate in a manned lunar landing. Since the first U.S. manned venture, Project Mercury, the Defense Department has provided massive support to the space program.

When John Glenn made three orbits of the earth, DOD had 20,000 persons, 126 aircraft and 24 ships deployed around the world to support the mission. By the time of the two-man Gemini project, increased accuracy and efficiency of support permitted a reduction of DOD forces. During Gemini 8, when astronauts Neil Armstrong and David Scott were forced to make an unplanned landing in the Pacific, DOD support had been reduced to 9,666 persons, 96 aircraft and 18 ships. Despite reduced support, an Aerospace Rescue and Recovery Service aircraft was able to reach its new recovery station in time to sight the spacecraft while it was still descending by parachute.

Apollo missions bring new challenges to DOD support personnel. The spacecraft is 6,000 pounds heavier, and there are three astronauts to recover. Efficiency of space flight support has increased with new specifically designed equipment, such as Apollo Range Instrumentation Aircraft and Apollo Instrumentation Ships.

For Apollo 7 mission DOD furnished about 7,200 persons, 49 aircraft and 14 ships from Air Force, Navy and Marine units.

During an Apollo mission, DOD land tracking stations, ships and aircraft join the NASA Manned Space Flight Network to form a global tracking and instrumentation system. These stations provide C-band and unified S-band radar tracking, telemetry, and command communications links to the spacecraft. During liftoff, a new Airborne Lightweight Optical Tracking System provides 70mm high-resolution motion picture coverage from a C-135 aircraft flying at 40,000 feet.

The North American Air Defense Command participates by furnishing NASA headquarters with tracking and impact prediction for all residuals left in orbit, flight plan updates, significant events and positions, and velocity vectors.

Eight EC-135N Apollo range instrumentation aircraft are assigned to the Air Force Eastern Test Range to support space flights. The four-engine jets carry 10-foot diameter "droop-snoots" which house seven-foot diameter antennas, the largest steerable antennas ever flown. The planes are packed with the latest electronic instrumentation—equipment specially designed for Apollo missions. Two of these aircraft, working as a pair, can provide 5,000 miles of continuous coverage.

Five Apollo instrumentation ships support space flight. In addition to providing electronic support, the ships can act as standby recovery

vessels or standby mission control centers. Converted World War II "Liberty" tankers and transports, the ships have been extensively modified with inertial navigation equipment and other positioning systems. Three of the ships have satellite communications terminals, permitting instant communication with Mission Control Center-Houston. The Military Sea Transport Service sails the ships for the Air Force Western Test Range.

Emergency recovery in the Launch Site Recovery area would be provided by Air Force helicopters, Marine Corps tracked recovery landing vehicles for operations in the surf, and Navy landing craft for deeper water recovery. Launch Abort Recovery, covering the time after the escape tower is jettisoned until orbit is attained, would be performed by ships and aircraft stationed in a 100-nautical-mile corridor centered on the normal ground track of the Apollo capsule.

In the Primary Landing Area, where the planned end of mission occurred, the USS Essex was the primary recovery ship for Apollo 7. Four other secondary landing areas have been designated for Apollo missions, in the East and West Atlantic and in the West and Mid-Pacific. Ships and aircraft cover all the recovery areas.

DOD Manager for Manned Space Flight Support Operations is Major General Vincent G. Huston, USAF.

